PUBLIC HEALTH REPORTS

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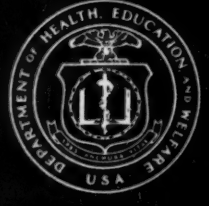

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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frontispiece

Tatzumbie DuPea, 109-year-old Paiute Indian. (In this issue papers and discussions deal with the aging processes.)

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PUBLIC HEALTH REPORTS

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
ARTHUR S. FLEMMING, *Secretary*

PUBLIC HEALTH SERVICE
LEROY E. BURNEY, *Surgeon General*

PHR

SYNOPSES

GOLDMANN, FRANZ (Harvard School of Public Health, Boston, Mass.): *Nursing service in homes for the aged. Public Health Reports, Vol. 75, December 1960, pp. 1124–1132.*

Organization of nursing service was studied in 1957 at 70 Jewish homes for the aged, and the amount of nursing service actually given was determined in 1958 for 530 residents of 5 homes.

Professional nurses made up one-eighth of the total nursing personnel, practical nurses one-third, and nurse aides and attendants more than one-half. The proportions of both professional nurses and practical nurses declined and that of nurse aides grew larger with increase in the size of the homes.

The ratio of all nursing personnel to beds averaged 1 to 5 and that of professional nurses 1 to 40, both ratios varying markedly with size of homes. Best supplied were homes with 400 beds or more and those in the 100- to 199-bed category, which together contained one-half of all beds. Homes with 100 to 399 beds, which provided almost three-fifths of all beds, led in employment of professional nurses.

The size of the total nursing staff was closely related to the proportion of beds in units for the care of ill and infirm residents.

At the five homes where case studies were made, 9 of every 10 persons in the residential units were receiving nursing service, mostly less than 1 hour a day. In the units for ill residents more than one of every four persons was receiving 1 to 2 hours of nursing service and a similar proportion from 2 to 4 hours. Almost 4 of every 10 infirmary patients required 2 hours or more of nursing service a day.

ENTERLINE, PHILIP E., and STEWART, WILLIAM H. (Public Health Service): *Estimated morbidity in the United States based on monthly labor force report. Public Health Reports, Vol. 75, December 1960, pp. 1151–1160.*

Starting in July 1947, estimates have been published in "The Monthly Report on the Labor Force" showing the total of employed persons in the civilian labor force 14 years of age and over, and the number of these persons who did not work at all the week preceding a monthly interview because they were ill.

During the period July 1947–September 1959, the percentages of ill persons ranged between 1 and 2 percent. No overall trends are apparent.

Fluctuations in these illness rates generally conform to fluctuations observed in illness rates for the Armed Forces; seasonal variations conform to those observed in illness surveys of civilian populations and to seasonal variations in Armed Forces data.

Influenza epidemics noted in studies of mortality are clearly shown in the labor force series.

Generally, information on illness reported in "The Monthly Report on the Labor Force" would seem to be a valuable supplement to other data regarding illness patterns and trends in the United States.

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Recent Advances in Geriatrics

G. HALSEY HUNT, M.D.

A GREAT deal of confusion exists between two aspects of aging, the biological process of aging and aging as we commonly observe it in old people. To distinguish between the two, I suggest that we need both better definitions and new terms. For the past year or so I have been using the following definition of the biological aging process as the basis for my own thinking in this field:

"The biological aging process is the genetically and/or developmentally determined, progressive, and essentially irreversible diminution with the passage of time of the ability of a living organism or of one of its parts to adapt to its environment, manifested as diminution of its capacity to withstand the stresses to which it is subjected, and culminating in the death of the organism."

Some people consider that this is a defeatist and pessimistic point of view because certain beneficial things happen with the passage of time. This is true, of course, but let us call beneficial developments by some other name, maturation or development, for example, but let us not designate as "aging" everything that happens to a living organism with the passage of time. I think we will get much further much faster if we take a definition that makes the straightforward assumption that each individual's clock is sometime going to run down, and that it is going to run down regardless of the incidence of overt illness. Pragmatically, it is sometimes hard to distinguish the effects of illness from the biological aging process, but conceptually I think it can be done. There now seems to be fairly general agreement that coronary heart disease or atherosclerosis should not be considered to be part of the aging process. Atherosclerosis occurs with increasing frequency with increasing years, but it is not part of the built-in mechanism of aging. It develops in early life in some people and essentially not at all in others.

I think that it would be particularly useful if we could develop a new name for the biological aging process, which would have fewer emotional overtones. For a time I thought "bio-entropy" would fill the bill, since this carries the implication that living organisms tend eventually toward disorder. When I suggested this to some of my scientific friends, however, I was reminded that "entropy" describes a state rather than a process and that we will have to seek further for the new word we need.

What we are really concerned with in the basic biological process of aging is the influence of the passage of time. Possibly "chronobiology" would serve as the generic descriptive term for the study of the effect of time on living systems. We then might use the term "anachronobiology" for the study of the processes of growth, development, and maturation, and "catachronobiology" for what I have defined previously as the biological aging process. These terms are admittedly clumsy, but as in legal phraseology, it is sometimes necessary to be somewhat clumsy in order to be precise.

Scope of the Problem

The Bureau of the Census estimates that the total population of the United States on July 1, 1959, including Armed Forces overseas, was 177,103,000, of whom 15,380,000, or 8.7 percent, were 65 years and over (*1*). The population 65 years and over has increased by about 3.2

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million, or 26.1 percent, since 1950. There were 12.2 million persons 65 and over in 1950, and fewer than 9 million in 1940. During the 1950's, this group increased by about 350,000 each year, or nearly 1,000 every day.

In any context, the problems of 15 million people who constitute almost 9 percent of the population deserve respectful attention. In the practice of medicine, however, we are already faced with the fact that the great majority of fatal illnesses occur in mature individuals. The tremendous advances in medicine and sanitation in the last 50 to 75 years have largely eliminated the great scourges, the acute infectious diseases and tuberculosis, which formerly brought death to so many infants and children and young adults.

Fatal illness is becoming increasingly the prerogative of the older age groups. In 1955, 56.5 percent of the deaths in the United States occurred in people over 65, and another 25.8 percent occurred in people 45 to 64 (*2*). In other words, 82.3 percent of all deaths in 1955 occurred in people who were 45 or older. In 1920, only 50 percent of deaths occurred in this same age group. If we equate death rate with serious illness, which we can probably do with only minor reservations, four-fifths of all serious illnesses now occur in this age group. Already, therefore, all physicians except obstetricians and pediatricians have to pay more and more attention to people 45 and older.

Geriatrics as a Specialty

This leads to the question of whether geriatrics should be developed as a separate specialty of medicine, complete with its own department in the medical schools. At present geriatrics is used rather loosely and usually refers to a sphere of interest rather than to a definitive specialty. Arguments can be advanced on both sides of the question as to whether or not it should become a recognized discipline. The principal arguments in favor of such a development are the sheer numbers of older people in the population and the fact that physicians and others have to be specially trained to give older people the proper attention.

The principal arguments against it are that most of the diseases and infirmities of age have their beginnings in middle life or even earlier (which leads some observers to conclude that the best "geriatrics" is practiced upon young and middle-aged adults); that it would cut across all established specialties except obstetrics and pediatrics; and that a "good doctor" for patients of 40 can be an equally "good doctor" for patients of 80 if he has the right attitude, which means giving them real attention and good medical care rather than just "tea and sympathy."

I have probably made it obvious that I lean strongly in the direction of not establishing geriatrics as a separate specialty, although in each community a few doctors may wish to identify their interests completely with care of the elderly and become known as geriatricians. I think all doctors except obstetricians and pediatricians should specifically concern themselves with studying and coping with the problems of the older age groups. They should all make specific efforts to prevent the development of disability insofar as this is possible and to treat disease and disability when they occur.

Although the aging process may be differentiated conceptually from disease processes, both

Research Projects in Aging

"Activities of the National Institutes of Health in the Field of Gerontology" is published annually by the Center for Aging Research, National Institutes of Health. This is a compilation of research projects in aging carried out under National Institutes of Health research grants and projects conducted within the laboratories of the Institutes. The 1960 issue lists about 560 projects directly or indirectly related to aging, representing a total annual cost of $12 million.

The research directly related to aging ranges from studies of the biological aging process to behavioral studies of older people, including studies of their relationships to their families, friends, communities, and jobs. The types of research classified as indirectly or secondarily related to aging includes cancer research, research in cardiovascular disease, arthritis, and other specific illnesses which are commonly found among the elderly.

types of process should be treated. Physicians should treat the aging process by conditioning the patient psychologically to accept and live with the fact that he is aging and to make the most of his remaining abilities. Disease should be treated vigorously, not simply to prolong life, but to give the patient an opportunity for a better life. It is important that when disabilities (including senile brain changes) do appear, patients be given the benefit of modern rehabilitation techniques. These may be as simple as urging and assisting old people to get out of bed for a time every day—primarily to permit them to carry out the activities of daily living. Patients should be encouraged to exercise their minds and their bodies. Possibly the greatest single advance in the practice of geriatrics in recent years is recognition of the degree to which senile bedridden patients can be rehabilitated.

Since the health status of people in old age is largely the result of a lifetime of habits of living, it is important that we all study ways and means of getting people of all ages to adopt habits of living that will promote the highest level of health. I regret to say that even members of the medical profession are frequently lax in putting into practice what they know about the promotion of good health.

I should like to quote from a statement before the House Appropriations Subcommittee by Dr. Lewis Thomas, chairman of the department of medicine, New York University College of Medicine (*3*):

"What will it be like in the year 2000? In 1920 the year 1960 must have seemed like a tremendous distance away, but here we are. There are, in fact, more of us here now, in sheer numbers, than ever before in history. And if there is any certainty in human affairs today, it is the certainty that there will be still more of us, a staggering number of us, in 2000.

"I do not believe in the inevitability of human disease. There is nothing preordained about senile psychosis, any more than there was about childbed fever a century ago. Cancer is not a natural aspect of the human condition, nor is heart disease, nor epilepsy, nor heroin addiction, nor multiple sclerosis, nor insanity, nor blindness, nor any of the lists of maladies which plague us today. Aging may be inevitable, and death is a part of nature, but disease is not, or needn't be, for humans. We have got to become a healthy species. This, it seems to me, is the task for medical research in the years that lie ahead, not for our own comfort, not for our remote posterity, but for the people who are the same distance from us in time as we are from 1920."

Specific Advances in Geriatrics

Before discussing some specific recent advances that are more or less directly related to geriatrics, I should like to mention the recently published "Handbook of Aging and the Individual; Psychological and Biological Aspects." Some 30 authors contributed to this book, which was edited by Birren. It is a comprehensive readable compendium of existing knowledge about aging in the psychological and biological fields (*4*).

For the purposes of this discussion, I have picked a number of representative articles culled from those written during the past year or two by the scientists listed in "Activities of the National Institutes of Health in the Field of Gerontology, January 1959." These papers cover the principal groups of pathological conditions other than cancer, which is a large subject in itself. In addition, I am excluding all studies on the basic biological aging process. Let me describe these studies briefly.

Atherosclerosis and Related Conditions

Stamler (*5*), discusses the epidemiology of atherosclerotic coronary heart disease in an excellent summary article with a long bibliography. He comments that while it is perfectly correct to say that no one can definitively predict whether a given person will or will not develop clinical coronary heart disease within the next year or two, long-term prognostications of the actuarial type can be made. Some will be false positives or false negatives, but in general, high-risk individuals can be identified, with the consequent possibility of successful prophylactic intervention.

Based on recent investigations, it is becoming quite possible to estimate the chances of high-risk individuals in specific quantitative terms. It can be roughly estimated that a low-

risk middle-aged man, normal in weight, blood pressure, and serum cholesterol, has 1 chance in 20 of developing clinical coronary heart disease during the age period 45–64. In contrast, a middle-aged man with two or three abnormalities (obesity, hypercholesteremia, hypertension) stands almost one risk in two. These are markedly different risks.

The critical question is whether the risk in high-risk subjects can be prophylactically reduced by correcting defects. The defects are amenable to partial or complete correction by relatively simple medical-hygienic means, the decisive one being dietotherapy. It is not yet known definitely, however, whether the risk of coronary heart disease can be significantly lowered by correcting these defects, although the findings of the life insurance companies on the positive results of correcting obesity are highly suggestive in this regard.

O'Neal and co-workers (*6*) report that arterial thromboses with myocardial and renal infarcts occur in a large percentage of rats fed a known atherogenic diet to which are added large amounts of saturated fats. Thromboses occur before the formation of significant local intimal lesions, indicating that some hematologic factor is involved.

The same authors discuss the pathogenesis of atherosclerosis and myocardial infarction in a further report of their experimental studies in rats (*7*). Among 178 rats fed cholesterol, thiouracil, butter, and sodium cholate, 45, or 25 percent, developed myocardial infarcts.

Davis and associates (*8*) report studies of cholesterol synthesis in the human liver. They conclude that in man the liver supplies a relatively small part of plasma cholesterol, with the extrahepatic tissues being a much more important source than is currently generally believed.

Spain and associates (*9*) report on the effects of estrogens on resolution of local cholesterol implants. They found that intramuscularly administered estrone in rabbits and mice enhances the resolution of local subcutaneous implants of absorbable gelatin sponge saturated with cholesterol. This occurred in the absence of any alterations in serum cholesterol levels.

Davis (*10*) comments that the ability of the clinician to demonstrate objectively the presence of coronary disease with currently available techniques is severely limited. He describes the use of the ballistocardiograph in the diagnosis and management of patients with coronary heart disease, and stresses the value of the ballistocardiographic cigarette test.

Simonson (*11*) discusses the gravitational effects of postural changes. The changes of the extracranial volume pulse, recorded by means of an impedance plethysmograph, in tilted head-up and head-down positions, are significantly greater in older than in younger men, indicating impairment of circulatory postural regulation with age. Surprisingly enough, this impairment is partially compensated for in coronary patients, possibly due to hyperactive carotid sinus reflexes.

Mental Impairments and Brain Pathology

Margolis (*12*) describes pathological observations in senile cerebral disease made with the aid of new techniques and includes a broad survey of the literature.

Obrist and Busse (*13*) describe the senescent electroencephalogram in a summary of findings on more than 1,200 elderly people. In healthy persons, the EEG undergoes definite but minor alterations with age, though the findings are not correlated with performance on intelligence, learning, or memory tests. In aged psychiatric patients, on the other hand, EEG alterations are more pronounced and there is a significant correlation with mental status. Psychiatric patients with normal or low blood pressure have more diffuse slowing than do those with mild hypertension. It is speculated that an elevated blood pressure may compensate for increased vascular resistance in old age, thus tending to maintain cerebral circulation and preserve a youthful tracing.

Loranger and Misiak (*14*) report on tests of critical flicker frequency and some intellectual functions in old age. They studied 50 female residents of homes for the aged, all between the ages of 74 and 80. Each patient was given the following battery of tests: critical flicker frequency, Porteus Maze, Wisconsin Card Sorting, Raven Progressive Matrices, Digit Symbol, and PMA reasoning. These particular tests of mental abilities were selected because performance on them declines markedly with age. All

the tests of intellectual functions, except the Porteus Maze, correlated significantly with CFF. The relationship of CFF and intellectual functioning in the aged is tentatively ascribed to a reduced central neural efficiency in old age, which adversely affects both CFF and some intellectual functions.

Collagen and Connective Tissue

Lansing (*15*) discusses the role of elastic tissue in atherosclerosis.

Boucek and co-workers (*16,17*) discuss the properties of fibroblasts, especially with relation to the development of atherosclerosis, and the effects of sex and tissue age upon connective tissue metabolism.

Kohn (*18*) reports a histological study of the relationship of age to the extent of swelling of connective tissue in the human lung in acid. Connective tissue in pleura and around blood vessels in lungs from young individuals swelled more than in lungs from aged individuals. The distinction between young and old was most marked in connective tissue around blood vessels larger than capillaries and least marked in pleura.

Rehabilitation Evaluation

It has long since been demonstrated, notably by Rusk and his associates, that intensive rehabilitation efforts will produce dramatic results in severely disabled individuals. Less is known, however, of the kind and amount of rehabilitation effort that is necessary to return bed-bound aged patients to a reasonable degree of self-care (or, preferably, to prevent their becoming bed-bound in the first place) and of the economic feasibility of providing various kinds and amounts of rehabilitation. Muller has made a preliminary report of the study that he and Tobis and others are carrying out to identify the kinds and amounts of rehabilitation activity that are desirable for patients in nursing homes, to develop measurements of the needs of the patients and of their improvement under treatment, and to determine the cost of various levels of treatment (*19*).

Osteoarthritis

Silberberg and associates (*20*) report a study of sternoclavicular joints of 200 persons ranging in age from the 1st to the 10th decades. They report that the incidence and severity of osteoarthritis in this series increased up to the age of 80 years. In individuals over 90 years of age, the incidence of severe arthritis was strikingly decreased. The lesions found in males were more severe than in females, and Negroes seemed to be more susceptible than whites. There was a positive correlation between osteoarthritis and diabetes and chronic renal disease, and between severe osteoarthritis and obesity. No correlation was found to exist between osteoarthritis and arteriosclerosis.

The relationship between arthritis and obesity did not seem to be based on mechanical factors. They report that hyperplasia and hypertrophy of the articular cartilage cells occurred early in the aging process, and the authors postulate that this may have some relationship to the development of osteoarthritis.

Thyroid Response

Baker and associates (*21*) studied the responses to the administration of thyroid-stimulating hormone to two middle-aged men (aged 46 and 51) and three elderly men (aged 81, 88, and 92). Responses of the middle-aged subjects were not substantially different from those of the elderly men, and the available evidence, which is meager, does not support the contention that with advancing age there is a decreased responsiveness of the thyroid gland to thyroid-stimulating hormone.

Spinal Reflexes

Frazier and associates (*22*) have measured spinal reflexes in rats. They find no significant changes in nerve conduction velocity with age, but do find an increase in central delay of the reflex. Histological analysis of 23 spinal cords in the lumbar region has been completed. The cell counts of the ventral horn show a steady decrease with age.

Conclusion

As a final comment, I suggest that research on the biological aging process is not going to solve the problems of old age, important as it is in furthering our understanding of basic life processes. We cannot even be sure that re-

search on the medical and social and economic needs of old people is going to solve these problems, but we certainly need to know much more, not only about the factors which lead to eventual death, but what is more important, about those that cause the disabling infirmities of old age. We must find out which infirmities can be prevented and how they can be prevented. We must find out how aging can most effectively be managed in order to give our fellow citizens the best possible opportunity for a decent and worthwhile old age, so that as they approach their terminal years, they may best contribute to their own happiness, to their families, and to society at large. This is not a new idea, but it may be that we are finally approaching the time when we can better fulfill the concept expressed by the ancient Greeks, that the art of living consists in dying young—but as late as possible.

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Some Aspects of Gerontology in the United States

STANLEY R. MOHLER, M.D.

TODAY in the United States the declining athletic prowess which accompanies aging, particularly after age 40, is far less significant occupationally to laborers as a group than it was two generations ago and earlier. This fact is a direct result of technological change, a development which, in effect, has provided the industrial energy requirements of the United States with calories derived for the most part from nonmuscle sources.

On the other hand, the laborer, white collar worker, professional person, and other categories of citizens find that although certain problems of aging, serious in 1900, are no longer so pressing, other problems have emerged which may in the long run prove far more difficult to resolve. Some will never be solved or compromised to the satisfaction of all.

Health

Cardiovascular and cerebrovascular disease, of which atherosclerosis constitutes the most frequently found pathological change, is the leading cause of death in the age group over 65 years. Cancer is second. Together these conditions account for more than three-fourths of the deaths of older persons. Acute respiratory infectious diseases are next most numerous among causes of death, followed by the category of accidents. Falls, motor vehicle accidents, and fires comprise 85 percent of the fatal accidents which occur among the aged.

Several usually nonfatal conditions are common among the aged. Periodontal disease is claiming most of the teeth lost after the age of 35. Cataracts in various stages of development are found in more than half of the individuals over 65. Almost all persons over 65 have some degree of hearing loss. Osteoarthritis is a cause of daily discomfort to many older persons and is particularly bothersome when it occurs in the hips and fingers. Osteoporosis, senile emphysema, and benign prostatic hypertrophy have their highest incidences, as expected, among the geriatric patients.

About 136,000 patients over 65 currently reside in State hospitals for the mentally ill, comprising about 30 percent of the patient load of these institutions. About 90 percent of these patients are diagnosed as "senile brain syndrome" or "arteriosclerotic brain syndrome." These diagnoses are far removed from schizophrenia and the affective disorders, conditions for which the institutions were originally established.

An important consideration in the mental health of the average older person is the fact that the United States has what sociologists have termed a youth-oriented culture. Apparently, the frontier-times respect for high physical capacity, associated with the ability to drop previous modes of life, break with tradition, and start anew, has not yet been replaced by other philosophies. This cultural milieu produces a feeling of inferiority in many older persons. It is thought that tendencies toward mental depression and hypochondriasis may arise on this basis.

Dr. Mohler is medical officer of the Center for Aging Research, National Institutes of Health, Public Health Service. *The article is based on a paper presented at the Section on Geriatrics and Gerontology, Pan American Medical Association, Mexico City, May 4, 1960.*

The ease with which he becomes fat plagues the average person in the United States as he ages. It appears that the appetite is one psychophysiological phenomenon which does not decline with age, and it may even become unmanageable. Some have estimated that the average adult is 10 to 15 pounds overweight. The problem with such estimates is that no one has been able to define "ideal weight" adequately.

In the short-stay hospitals of the United States, there is about 1.0 hospital-day per person per year for the age group 25–64. For the age 65 and over bracket, this statistic is 1.8. Furthermore, those in the over 65 bracket stay an average of 15 days per hospitalization, while those in the 25–64 age group stay 9 days. In chronic disease hospitals, nursing homes, and related institutions the aged occupy the vast majority of the beds.

At present, various methods of meeting the medical expenses of the elderly are receiving national attention. It is apparent that a certain segment of this expense must be met by the community at large. Possibly the community may be able to cut expenditure considerably by investing in certain rehabilitation and home care programs.

Income

Increases in technological complexity cause the older worker certain difficulties if he should seek a new job. It is quite possible to find that one's skills have become hopelessly outmoded after 30 years' employment in a given occupation.

Recently a congressional subcommittee observed that at least half of the aged in the United States cannot afford decent housing, medical care, or recreation. Also, fixed incomes after retirement, derived from pensions of various types, are often diluted by the effects of inflation.

Retirement

After a life of busy, gainful employment, free time becomes a heavy burden for the retiree. A search for satisfying pursuits is facing most retired persons.

A number of retired persons are moving to parts of the United States having warm weather the year around. Florida, Arizona, and southern California are the popular areas. We have not yet fully assessed the impact of such moves upon the retiree, particularly when the relocation means loss of touch with lifelong friends, family members, and familiar environments.

A critical factor in retirement is the matter of retaining a feeling of self-respect. When one is no longer a breadwinner, and particularly if one reverts to a dependency status, feelings of uselessness are apt to occur.

Housing

The new high-rise apartment houses for the elderly may be ideal for some older persons, but certainly not for all. The absence of younger people may be disturbing to many. On the other hand, such facilities do provide a convenient constellation of potential companions.

Three-fourths of the persons over 65 in the United States live in what could be termed a family (living with a spouse, blood relative, or relative by marriage or adoption). Of the remaining older persons, one in five lives with nonrelatives, while four in five live alone.

Today's picture in regard to old folks homes and nursing homes has radically changed, when contrasted with the situation in 1900. The modern domiciliary institution, particularly the home for the aged, is not a refuge for the indigent. It is becoming a place where enlightened staff members counsel and assist residents in regard to various daily activities. The demand for such facilities still exceeds the supply.

The Family

Three-generation families present complex social problems. The rapidly growing suburban areas, crowded with houses designed for two adults and two children and characterized by minute yards and inadequate recreational facilities, do not provide places for grandparents.

Nevertheless, it is true that many children must, upon reaching adulthood, take in their aged parents. The conflicts which often characterize such associations can have serious mental health consequences, particularly in societies with rapidly changing ideals. The young

adult's scorn for his aged parent's beliefs leads to intrafamily strain and feelings of misunderstanding and guilt.

Research

The health-related aspects of aging are receiving the attention of numerous researchers. However, many believe that the gap between what we need to know about aging and what we do know is so large that much more research is required. To this end, the Federal Government has established various administrative components which spend full time on matters pertaining directly to aging. Many State and local governments have followed suit, and various private organizations which focus on aging have come into existence.

Last year the National Institutes of Health of the Public Health Service granted about $12 million to various medical schools and universities for studies on aging. Other agencies and organizations also provided support for gerontological investigations. These efforts must continue and expand, for, like the mythological Hydra, who, upon losing one head, would regenerate two, the solution of one gerontological dilemma results in others still to be resolved. Indeed, some of the individual's ultimate problems of aging will only be solved through death. In other words, rather than devoting our energies and philosophical efforts to endeavors which seek to attain that will-o'-the-wisp, agelessness, the Public Health Service is fostering the approach which seeks to preserve optimal well-being throughout the natural life of the individual.

Delegates of the States and territories of the United States will meet in Washington, D.C., for the White House Conference on Aging on January 9 to 12, 1961. This will be a nationwide attempt to further delineate current problems in gerontology and formulate recommendations for action. The postconference report to the President of the United States will summarize the information highlighted by the conference.

Hearing Impairments in the United States

The relative frequency of hearing impairments in the United States rises rapidly with advance in age, according to a report by the U.S. National Health Survey on "Impairments by Type, Sex, and Age, July 1957–June 1958." The frequency increases in the following manner:

Age period (years)	*Rate per 1,000 persons*
All ages	34.6
Under 25	7.9
25–44	20.6
45–64	52.2
65–74	129.2
75 and over	265.4

More than two-fifths of the estimated 5,800,000 people in the Nation with impaired hearing are 65 years or over, an age group constituting one-twelfth of the total population. More than half a million people under 25 years and nearly a million in the age group 25–44 years are affected by such impairments.

Other findings are that hearing difficulties are more common among males than among females; 40 out of 1,000 males have such impairments, a rate one-third higher than for females.

The higher prevalence rate for males may reflect their greater exposure to accidents and noise hazards in industry. In fact, the proportion of hearing impairments traced to injury is one-fifth among males compared with one twenty-fifth among females.

Five types of cooperation tried successfully in various settings suggest paths by which hospital and nursing home relationships can be strengthened in the interest of better patient care and better community health planning.

Expansion of Cooperative Relationships Between Hospitals and Nursing Homes

ROBERT MORRIS, D.S.W.

DESPITE a limited basis for optimism, the prediction that cooperative relations between hospitals and nursing homes will expand is justified, for nursing homes have become a major component of comprehensive medical care. They now provide more than 450,000 beds, almost as many as general hospitals. The services they can offer represent one way of meeting needs brought to light by such modern conditions as the growing importance of chronic and long-term illness, emphasis on active treatment of all illness, the increasing demand for forms of nursing and physical care that cannot be provided in private homes, and the rising cost of hospital and medical care.

Most of the development in nursing home care has taken place outside the mainstream of medical care and health organization, and it has not been much influenced by the health professions, except in regard to safety, sanitation, and minimum nursing standards. Nevertheless, it is recognized that hospitals and nursing homes can serve each other's purposes. We need to go further and ask how these institutions, which are so different, can be brought together as partners in the same health-serving team. This partnership is essential if the words "continuity in medical care" or "comprehensive medical care" are to mean anything to patients, especially those with extended illnesses.

The difficulties of partnership are apparent if we consider the basic characteristics of these two organizations. The hospital is usually a nonprofit corporation, with a large number of beds, a rapid turnover of patients, a large professional staff of doctors, nurses, therapists and sometimes social workers, an administrative staff, a board of trustees, and wide support from the community through philanthropic gifts and government payments. The nursing home is usually a small institution administered by an individual for profit, with a nonprofessional staff supervised at best by a registered nurse and with occasional medical supervision. It cares for patients who stay for months and whose conditions change slowly, and it is dependent on current payments to keep going.

These real differences have been accentuated by unfortunate attitudes of doubt and suspicion. Hospitals have often complained about conditions of care in nursing homes: that simple physical and nursing care is poor, that patients are admitted who might be better cared for elsewhere, that they are kept bedridden unnecessarily. Nursing homes in turn have com-

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plained that hospitals are officious and authoritarian, that they refuse to share information about patients to be transferred or to plan in advance for their posthospital care, that they refuse to help the homes do those realistic things which can raise the level of care and still be within the reach of institutions with limited staffs or within patients' ability to pay.

Can two such different organizations really work together successfully? Experience in several communities suggests that they can, given a minimum of willingness to cooperate and to put aside suspicions of the past.

A willingness to work closely together implies sharing of purposes, agreement about common goals. In many respects these two institutions may have somewhat different goals. One is directed by the most advanced medical arts and sciences; the other, by the less complex aim of providing physical care. One is motivated by a desire to make sufficient return on investment; the other is concerned with keeping the deficit as low as possible. Despite these differences, both institutions care for sick people, and both can be interested in seeing that each patient receives the kind of care he requires, as measured by the best medical knowledge. Hospitals, as the community center for medical care, are, or should be, concerned with what happens to patients before and after their stay in the hospital; nursing homes are, or should be, concerned with the standards of good care.

Five general types of cooperation have been tried—tried successfully—but it must be confessed that they cannot yet be called typical, for there are still too few examples. The examples involve proprietary homes, nonprofit homes, hospitals, and public health or welfare departments, but the experiences of each may be useful for understanding the subject we are discussing. The five types of cooperation are: informal arrangements for transferring patients, training exchanges, joint planning for patient care, joint appointment of specialized staff, and administrative integration.

Informal Arrangements

An informal arrangement for transferring patients from hospitals to nursing homes is the most common form of cooperation. The need to plan discharge of many hard-to-place patients is often so pressing that a member of the hospital staff, usually the social worker, must be on friendly talking terms with nursing home operators in order to locate the right home for a specific patient at the required time. Some hospital staff members, almost accidentally, know a number of homes well. They can advise families and physicians which ones are best able to give the kind of service required, and can locate vacant beds in an emergency.

This approach has been carried further in a few communities. For example, the St. Francis Hospital in Peoria, Ill., sometimes invites the nurse director of the Washington Nursing Home in Washington, Ill., to predischarge conferences so that the home can share in the discharge planning and can make adequate preparations for the patients. The arrangement has worked so well that similar conferences are often held when nursing home patients have to be readmitted to the hospital for recurring active treatment periods.

The conferences have proved to be a wonderfully simple way to bring nursing home staff into the medical care team and to give them the feeling that they are an accepted part of medical care. The staffs of the two institutions can learn something about each other's way of working and thinking; a certain amount of teaching can take place, and a cooperative spirit begins to develop.

Such conferences, of course, are not necessary for every patient. They are especially useful when physicians prescribe treatment which is to continue after the hospital stay and which requires controlled care in a nursing home or periodic return to the hospital.

Training Exchanges

In some communities selected nursing homes are used by professional nursing schools or by schools for practical nurses to help train students. The homes are not affiliated formally with the schools, but are used as field resources. In some programs the students merely observe nursing home care; in others, they actually work in a home for a few weeks and carry out nursing or nurse aide duties under supervision.

Examples of nursing homes in which training programs operate include the Mahoney Nursing Home, Peoria, Ill., McKinney Nursing Home, Yonkers, N.Y., Manor Rest, Montrose, N.Y., and the Capitol District Home for Jewish Aged, Troy, N.Y.

These opportunities for observation or work in a nursing home enrich the student's experience and give her some knowledge of care in long-term institutions, where the tempo and objectives are so different from those of a general hospital. At the same time, they stimulate the nursing homes, which are necessarily on display, to do a better job. Careful advance planning between the nursing home director (usually a registered nurse) and the nurses' training supervisor is required so that new professional skill can be brought into the home. The result is that key staff get to know and trust each other, as well as to learn from each other.

Much in the experience of the nursing homes can be put to good use by hospital nursing staffs and the nursing profession, especially in regard to care of long-term patients. To cite one example, a recent series of field studies conducted in nonprofit nursing home programs for the aged revealed the fact that bedsores were no problem even for patients who had been bedridden for long periods. Yet when some of these same patients were transferred to a hospital for treatment of 10 days or 2 weeks, they returned with new bedsores. The explanation probably is found not in "bad" nursing as measured by general hospital nursing standards, but in the difference in nursing technique for short-term and long-term patients, a difference about which nurses in general hospitals may have something to learn.

Another kind of teaching exchange arrangement has been tried in several communities between public health or public welfare departments and nursing homes. In one form the public agency employs nursing educators, occupational and physical therapists, and social workers to help interested nursing homes train their own staffs in modern concepts of rehabilitation and patient care. Examples are found in the State program of the Illinois Public Aid Commission and the local program of the Erie County Health Department, Buffalo, N.Y. The specialists, available at the request of the nursing home, are prepared to instruct either the nursing supervisors, nurse aides, or attendant staffs in new techniques. Even though home staffs change rapidly, it is hoped that a core of workers will be trained over a period of years.

The advantages of this arrangement can be very great. Nursing homes are usually too small to provide the kind of continuous on-the-job training which medical and nursing care seem to require. A public agency, or for that matter a hospital, can use some of its training staff to raise the standards of nursing home care. This educational approach can be especially important in helping nursing homes apply new knowledge about rehabilitation through which disabled persons are helped to maintain the level of self-care they have reached after active treatment under medical control.

A variation of this approach is based on the belief that small nursing homes cannot ever provide the services of specialists which proper nursing home care requires, except at exorbitant cost to the patient. Such care, based on the most advanced principles of comprehensive medicine and rehabilitation, requires a variety of skills and equipment for a variety of special patient conditions. To meet this situation, some health departments employ nutritionists, physical therapists, occupational therapists, and social workers to give direct service to patients in nursing homes, following physicians' prescriptions. With this help the cooperating homes can expand and upgrade their services as well as increase the skill of their own staffs. These programs have sometimes been started with a minimum of organizational superstructure. One health department employs a team of specialists to work a few hours a week in nursing homes. However, even the most informal plan has required someone to arouse interest among nursing home operators and to overcome their suspicions.

Providing specialists' services is still experimental, and it remains to be seen whether, in time, the nursing homes can support these services on their own. There are several possibilities along this line. Groups of nursing homes may want to pool their own funds to employ specialist staff for their joint use, or public health and welfare agencies may want to

continue to provide such staff as a community service. These programs are, after all, a natural extension of the licensing function now carried on by these public departments. They mean that the department not only sets standards, but goes ahead realistically to help nursing homes achieve those standards in daily practice.

Alternatively, general hospitals may want to enter into similar arrangements with one or a group of homes which their patients use. It might seem that this undertaking would overburden hospital staffs and increase the already high cost of hospital care, but actually it may prove less costly than inadequate care which results in hospital readmissions or unnecessarily prolonged disability.

There are many other ways in which hospitals can share information and help raise nursing home standards. A number of nonprofit nursing home programs for the aged have obtained expert help from hospitals in rebuilding their facilities, in planning kitchen layout and organization of food service, and even in recruiting nurses or nurse aides. There is little reason why similar arrangements cannot be extended to the proprietary field.

Joint Planning for Patient Care

Joint planning between a hospital and a nursing home may seem like an effort to pair off a dwarf with a giant but it has worked. A recent study of 10 cooperative programs between general hospitals and nonprofit homes for the aged indicates several ways in which joint planning can benefit both types of institutions. This study was part of a large-scale inquiry into coordination of health services for patients with long-term illness conducted by the Council of Jewish Federations and Welfare Funds. The institutions were located in St. Louis, Chicago, Cincinnati, Philadelphia, Baltimore, Troy, N.Y., New York City, and Toronto, Ont.

The key to the cooperative programs was development of mutual confidence and trust. In every instance, the institutions began with a massive distrust of each other and skepticism that anything could be done that would not serve one institution at the expense of the other. The hospitals were convinced the homes gave substandard care and did not want to improve. The homes were certain the hospitals only wanted to "dump" difficult patients and didn't care what happened to them, or feared the hospitals wanted to swallow up and dominate the administration of the homes.

Despite these obstacles, the 10 projects demonstrated several areas in which the work of these institutions could be planned jointly with beneficial results for the patient in the form of continuity in care and improvement in services in both institutions. This joint planning has been carried out with strict regard for the administrative and financial independence of the nursing homes, and all steps were taken by mutual agreement.

A major achievement was agreement about transfer of patients between hospital and nursing home. This means that the hospital must determine exactly what each patient needs in the nursing home and share the information with the nursing home staff in advance of discharge. Those who need much help to retain their physical functioning are sent only to homes able to give such care. Those who need to progress gradually from bed to ambulation are sent to homes with staff able to follow this cycle. Those with mental complications are sent to homes capable of coping with the extremes of human behavior. These arrangements also provide for emergency or planned return of patients to the hospital without delay. In effect, the nursing homes are assured of priority hospital admission for certain classes of patients.

The cooperation has gone further in several communities. Prescribed regimens of physical or occupational therapy, clinic treatment, and continuing diagnostic studies for nursing home patients are carried out by physicians who use the hospital resources just as freely as if the patient were still in the hospital. The hospital laboratory does diagnostic work on request; occupational therapists or physical therapists give treatment as prescribed. All the special facilities of the hospital are immediately available to the physicians who supervise the patients in the nursing home. There is no need to delay treatment because it is hard to get, because the home does not have the resources, or because no one wants to readmit the patient

to a hospital bed. Usually transportation back and forth must be arranged, although in some communities the hospital staff visits the nursing home regularly as if it were an extension of the hospital, especially for certain mobile laboratory and treatment procedures.

Initially, there was fear that these arrangements for sharing services would lead to abuses of the hospital's overbusy staff, but the fears have proved unjustified. Moreover, the arrangements have produced an unexpected side benefit. Previously, a significant number of patients were readmitted to a hospital because the nursing home could not provide proper care or because there was not enough medical backing to give the home confidence that it could safely care for these patients. In the joint programs, many such patients were satisfactorily cared for in the home, with the assurance of hospital backing as needed. The result was a decreased demand for hospital readmission and a less-than-predicted demand for outpatient services.

Joint Appointment of Key Personnel

Joint planning for patient care has sometimes led to another level of cooperation, joint appointment of key personnel. The crux of the 10 plans studied has been a growing unity in medical and nursing understanding. As this developed, administrators of the two kinds of institutions were able to agree about the physicians and nurses who could work together. Several nursing homes (for example, the Lucien Moss Home, Philadelphia, the Jewish Center for the Aged, St. Louis, and the Beth Abraham Home, New York) have consulted hospitals about selection of a physician to serve as medical supervisor or director of the home's medical program. In each instance the home chose its physician from the active hospital staff, and more important, chose him with the advice of either the hospital director or the chief of the hospital medical service. In at least two nursing homes (the Lucien Moss Home and the Jewish Center for the Aged) the nursing supervisors have been drawn from the hospital nurses' teaching staff, on the basis of consultation with the nursing director.

These steps must seem like a radical development, and I cannot emphasize too strongly that they were taken because both nursing home and hospital wanted them. Both agreed to them voluntarily without any loss of independence in control of their own policies. The hospitals needed a nursing resource in which they could have complete confidence, and the homes were able to improve their care at minimum cost by drawing on the resources of a hospital.

In a few instances cooperation has gone still further, to full integration wherein the hospital takes over the administrative and financial control of a nursing home and operates it as an arm of the hospital. This may prove to be a useful path for future development, but it cannot soon affect the thousands of independent nursing homes, both proprietary and nonprofit, which will continue to exist as independent organizations.

Conclusion

The five major types of cooperation—informal arrangements for patient transfer, training exchanges, joint program planning, joint appointment of key staff, and administrative integration—suggest several paths by which hospital and nursing home relationships can be strengthened in the interest of better patient care and better community health planning. They are practical means by which a vast new resource is added to the community health team. Nursing homes are already a significant factor. There remains the task of learning how to bring them into the medical care family, along with physicians, nurses, hospitals, health departments, social agencies, and others.

We have relied for a long time on licensing and control as a way to work with nursing homes. These examples point a new way, the way of cooperation and mutual help, to close the gap between these two sectors of our medical organization.

What we now require is some center or impetus in every community and in every State to encourage the widest spread of these tested methods for voluntary cooperation. Hospital associations, medical societies, public health and welfare departments, health councils, and associations of nursing homes are equally suitable leaders. Which will take advantage of the opportunity?

Health and Welfare Services for the Aged

ALBERT L. CHAPMAN, M.D.

AS AGE progresses, tissues tend to dry out and the skin tends to wrinkle; cells atrophy and degenerate; the metabolic rate is lowered; reaction time decreases; and the repair of damaged tissues is slowed up. But the aging process proceeds at a slow pace in most people. It is particularly retarded in those who live moderately and plough back into their lives some of the profits of healthful living.

Excesses of drinking, eating, smoking, and worry, too little sleep, exercise, and relaxation—these are the tubercle and diphtheria bacilli, the streptococci and staphylococci of old age. These are the factors that invite premature degeneration of the mind and body. Yet these are the very factors over which everyone has considerable personal control.

A second characteristic of older people is poverty. Eighty percent of those over 65 have a cash income of less than $2,000 a year; 60 percent have less than $1,000 a year.

And the incidence of chronic illness, as one would expect, rises rapidly with age. That is why older people use hospitals more frequently than younger people and go to physicians more often. This compounds the economic plight of oldsters. In the last decade the rise in the cost of hospital and medical care has outstripped even the rapid rise in the overall cost of living.

Characteristics of Long-Term Illness

The chronic diseases, often called long-term illnesses, are different in many ways from the acute infectious diseases which have been brought under substantial control since 1900. But two outstanding differences have a distinct bearing on the problem we are now considering.

First, the chronic illnesses are characterized by a long latent period when the existence of disease usually is unknown to its victim. However, this is the period when screening procedures, in many instances, can unmask the disease so that physicians may initiate treatment early.

The second difference is that chronic diseases are characterized by their chronicity. To be specific, if a 35-year-old woman is found to have diabetes or heart disease, she must learn to accept the fact that she will have the disease until she dies. This does not mean that she will be sick the rest of her life. She may, and usually does, live a fairly normal life. That will depend to a great extent on her willingness to face up to reality, to accept the fact that she will need continued medical supervision throughout life and that she will have to live within the limits imposed by her disease.

Preventive Approaches

There are four approaches to the prevention of disability and premature deaths from chronic illness which, in a sense, are time oriented.

The first of these I call "preventive living." This term is derived from that familiar phrase "preventive maintenance" so often applied to the care of equipment in order to extend its period of usefulness.

All of us have weak links in our chain of

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life, weak links with which we are born and which we have inherited. Therefore, we are more susceptible to one type of disease than another. One person may be prone to develop high blood pressure, another diabetes, and another rheumatic heart disease.

It is important, therefore, to make it a practice to go to a physician at periodic intervals throughout life so that he may have the opportunity of detecting these weak links as early as possible. As ideal as an annual physical examination sounds, it would be impractical for everyone to have a physical examination every year. There wouldn't be enough doctors to go around. However, a thorough checkup every 5 years before age 40, a 3-year checkup from 40 to 60, and an annual checkup thereafter would go a long way toward keeping everyone fit and cutting down hospital and medical bills. Physicians would see more patients, but they would see each patient less often.

Certain habits are harmful to everyone regardless of the nature of the weak links in the individual's chain of life. Obesity has been strongly indicted as a precursor to many chronic diseases. With the increasing popularity of alcoholic beverages and their more widespread acceptance as social trappings, the incidence of alcoholism is increasing and with it cirrhosis of the liver. Heavy smoking as well as air pollution has been linked with an alarming increase in lung cancer. Peptic ulcers are said to affect 10 percent of the American people at some time in their life. Worry, emotional stress, bad eating habits, lack of sleep, all these are suspect. Hypertension has been linked with living habits as well as heredity.

The list of correlations between specific chronic disease states and immoderate living is almost endless. That is why I place so much emphasis on the importance of preventive living, particularly during adult life. At a time when science has not yet determined the specific causes of heart disease, cancer, strokes, or high blood pressure, people must learn to help themselves. There is a limit to what the doctor or the health officer can do for them.

The growing appreciation of the need for periodic health examinations and the increasing number of older people places a heavy demand on the time of overworked private physicians. Unfortunately as the demand for preventive health examinations grows, the number of physicians per thousand people is decreasing. To take up some of the slack, more screening examinations are being done, not to substitute for comprehensive physical examinations performed by physicians but to supplement them.

Only a limited number of diseases and conditions can be detected by screening examinations, but, in a growing number of States and localities, these examinations are sending thousands of people who had no idea they had a chronic illness to physicians for diagnosis and treatment.

Care and Rehabilitation

The lack of financial resources of most old people, the chronicity of their ailments, and their natural preference for care at home have been documented over the years. As a result, growing importance has been attached to the development of methods that will make it possible to take health services to old people in their own homes. For example, more and more local health departments are providing bedside nursing services, and in Person County, N.C., and in many large cities the value of home care programs has been demonstrated. The newly recognized category of homemaker is being grafted into health and welfare teams in a growing number of communities.

Through the efforts of the American Nursing Home Association and other interested groups the quality as well as the quantity of nursing homes is being raised year by year. If adequate financial support is provided for the care of guests in nursing homes, reasonable and humane minimum standards of care can be developed. But in many States, welfare payments are not sufficient to meet the costs.

The mounting toll of needless disability among the aged caused by strokes, arthritis, and fractures has focused the attention of medical and public health workers on the need for more extensive early rehabilitation services. Many of the permanent disabilities among older people should never occur. These disabilities which keep many old people from working and from caring for themselves could be prevented

if early rehabilitation services were made available. Private physicians with the assistance of public health nurses and physiotherapists, where they are locally available, are now providing disabled patients with rehabilitation services in their own homes with a considerable degree of success.

Fiscal Considerations

In considering how to pay for the many new types of health services that will be required by the aging population, it may be well, in deference to accepted patterns of providing medical care, to discuss the care of indigents and nonindigents separately. About 60 percent of people over 65 are now receiving old-age and survivors insurance benefits, and an additional 10 percent are dependent upon public assistance.

These people, with such limited incomes, can pay for needed health services only with great difficulty if at all. Very few of them are included in the one-third of the "over 65" population able to purchase voluntary health insurance. As time goes on, a larger percentage of old people probably will be enrolled in voluntary health insurance plans, and the percentage of those who will be covered by private pension plans, in addition to OASI, will increase significantly.

It is even conceivable that public opinion will evolve to the point where retirement income will be set at approximately the level of peak individual income. In other words, old people will not be penalized for simply growing old. One of the commonest fallacies extant today is the belief that old people don't need money. This belief, in my opinion, represents selfish rationalization on the part of adults who have no desire to share their income with the aged. It may be seen then that we can look for a gradual improvement in the ability of old people to purchase the health services they need, but the problem in no way will be solved in this fashion.

One service that can be provided without violating present concepts of medical care is the supplementation of health services to indigent ill persons by State and local health and welfare departments working cooperatively with private physicians. State and local health departments should and must become much more deeply involved in the administration of existing medical care plans for indigent ill persons. The belief that to do so might incur the misunderstanding of the medical profession is no longer justifiable. Many health officers still parade this belief in order to avoid taking on additional and sometimes burdensome responsibilities.

State and local welfare departments must find ways to provide and finance more preventive types of health services for older people. More screening services for adults and aged could pay large welfare dividends. More rehabilitation services could increase the earning capacity of disabled indigents and decrease the need for providing them with costly personal care services. More home care services could lower the level of hospital bills for indigent ill persons.

Any improvement in health services for the indigent segment of the population will be reflected in an improvement in the quality of care given by private physicians, hospitals, and health departments to the nonindigent population. Good medical practices like good manners are contagious. State and local health departments can provide many ancillary health services if the need for such services is recognized by private physicians and if a willingness is shown to use them.

In supervising the care of old people with disease, strokes, diabetes, fractures, and arthritis, many supplemental services, badly needed by private patients, could be more economically provided by nonmedical persons. Nutritionists, nurses, physiotherapists, social workers, and technicians have skills and competencies which could be invaluable to overworked physicians who often labor singlehandedly. These skills, if added to local health or welfare department staffs, could be made available to assist private physicians in the care of their chronically ill patients. This could be done and has been done in such a way as not to abridge traditional doctor-patient relationships.

Coordinated Community Care

The growing sophistication of health services for the aged, the increasing complexity of

community patterns for providing these services, and the multiplicity of agencies purveying them have combined to create an urgent need for a better coordination of community care services. In New York City more than 3,000 different agencies, official and nonofficial, provide health care. In one city of 500,000 recently studied, more than 500 health agencies were identified. Even in remote rural counties the number of agencies interested in the provision of health services rarely drops below 25. This too often means that agency services are provided in an uneconomical and ineffective fashion. Duplication is rife.

In several communities leadership has evolved. Agency representatives have met. Health needs have been identified. Health resources have been tabulated. Gaps in health services and facilities have been documented. In this way, the duplication and overlapping of health services is being reduced to a minimum.

The need for services is growing so rapidly and the resources are so relatively few, none can afford to be wasted. It matters less who takes the lead in stimulating the development of such a plan than that such a plan be developed. In one community, leadership may evolve from the medical society; in another, leadership may arise in welfare or health departments; or voluntary health agencies may take the lead.

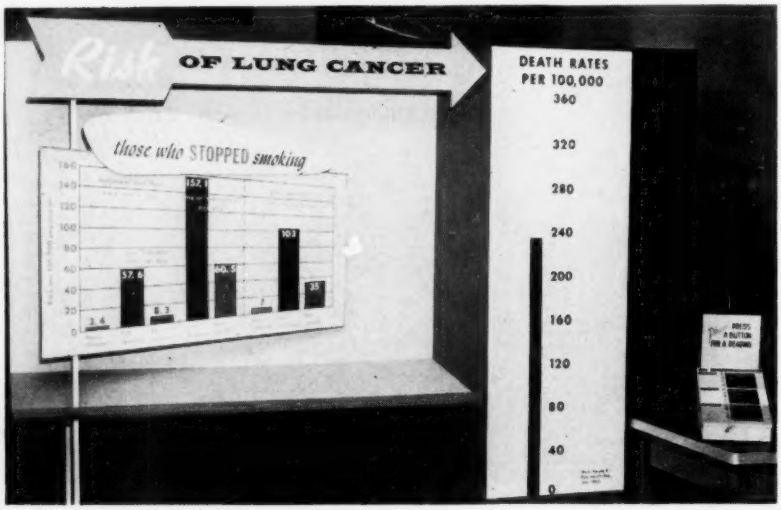
Aging has moral, economic, health, and social facets. The fact that there is a problem of aging is indeed fortunate, for it stems from the scientific successes which brought the dreaded infectious diseases under substantial control and which promise in the years ahead to ameliorate the ravages of such diseases as heart disease, cancer, and arthritis.

exhibits

Risk of Lung Cancer

The risk of developing lung cancer according to the number of cigarettes smoked and the age of the smoker, as well as the lessened risk for the ex-smoker, is depicted in this exhibit. It features a thermometer with an accompanying pushbutton panel control box containing 12 buttons arranged according to number of cigarettes smoked and age group (55–59, 60–64, and 65+ years). When a button is pressed, a column of lights in the thermometer reveals the death rate per 100,000 population for the appropriate category. The figures presented were derived from studies by Dorn, by Hammond and Horn, and by Doll and Hill.

Available on loan from the Cancer Control Branch, Division of Special Health Services, Public Health Service, Washington 25, D.C., the exhibit must be requested at least 1 month before the date desired. The branch will pay all costs of shipping and installing at large national and regional meetings, but for smaller meetings of primarily local interest these costs must be borne by the borrower. Instructions for assembling the exhibit are attached to the inside door of each of its two packing crates. It can be assembled by two men in 30 to 45 minutes.



Specification: (No. CC–5.) A free-standing exhibit, 7 feet high and 8 feet wide, total weight 475 pounds including packing crates. Lighting fixtures require one 1,500-watt outlet. Column of lights is seen to best advantage when booth is 10 feet deep, or wide enough to prevent table on which the panel control box sits from interfering with spectator's view.

Health for Older People

Guidelines to promote the positive health of older people emerged at the 1960 National Health Forum, sponsored by the National Health Council, held in Miami Beach, Fla., March 14–17, 1960. Approximately 600 authorities from health, medicine, education, religion, government, social welfare, industry, and labor participated. Following are summaries of five papers indicating some of the achievements and promises of research on aging and the potentials for extending healthy and satisfying life.

Current Research on Aging

brief

Medical research, having prolonged life, seeks to maintain the functioning efficiency of the aged person's body and mind. To fulfill this aim, the physician seeks to distinguish the cause and course of diseases from irreversible senescence.

Atherosclerosis is a good example of the opportunity for such distinction. Long thought to be an aging process, it is now considered a metabolic disorder. As the causal process in coronary artery disease and cerebral vascular disease, it is ultimately responsible for most strokes and heart attacks. Current research in atherosclerosis, mostly biochemical or metabolic in focus, is essentially directed at preventing atherosclerotic changes. Clinical assessment of the degree of atherosclerosis is basic; detection is rare until the function of some vital organ has been impaired. At present, none of the various therapeutic interventions attempted has proved of value.

Based on a paper by Ewald W. Busse, M.D., chairman, Department of Psychiatry and Council on Gerontology, Duke University Medical Center, Durham, N.C.

Surgery has been the most rewarding method of correcting atherosclerotic blood vessels. Replacing diseased segments of the larger vessels with tubes of a chemically inert substance has achieved a cure. But surgical techniques have not yet been perfected to treat the smaller but equally vital vessels that supply blood to the brain and the heart. Also, surgery has obvious limitations when atherosclerosis is extensive.

But research on diseases of the aged is progressing, and reports of such gain are expected from the Medical Research Committee of the White House Conference on Aging.

Recent clinical dental research has shown that loss of teeth after age 35 is due most commonly to periodontal disease, the result of inflammation or degenerative processes of the supporting tissues of the teeth, rather than diseases of the teeth themselves. Consequently dental researchers have turned to oral hygiene and its relationship to systemic disease. Clinical dentistry currently concerns itself with controlling or managing periodontal disease, rather than curing it. The need for workers in dental research is critical.

Research in dermatology is emphasizing the correlation of physical insults, such as excessive exposure to sunlight, weather, and radiation,

with changes in the skin. Most skin cancer in older people develops slowly from benign lesions. As there is considerable difficulty in evaluating potential malignancy, research leading to better prognostication is needed. Pruritis, a common disorder of the aged, while not jeopardizing life, is distressing. Adequate therapy for senile pruritis is lacking.

Optimal nutrition for the aged, although based on the same requirements as those of the mature adult, is not consistently realized. Partly responsible are changes in body processes, such as decreased secretion of digestive juices, reduced motility of the gastrointestinal tract, and impaired biliary function, which limits tolerance of fatty foods and may result in an insufficiency of fat soluble vitamins. Inadequate nutrition is also associated with reductions in the general metabolic rate, restricted physical activity, and impairment of the senses of taste and smell. Most nutritional research has been done with laboratory animals and relates diet to general health. Closely controlled longitudinal studies with human subjects are required to evaluate the effect of diet on the process of aging.

Cataracts, macular degeneration, and glaucoma are eye diseases most common among older persons. Untreated, these can cause blindness or serious impairment of vision. Surgery is effective in removing cataracts, and glaucoma can be treated by chemotherapy, but there is no adequate treatment of macular degeneration. Almost nothing is known of the causes of these three diseases, and a great deal of basic research in their pathogenesis is needed.

The organic brain syndromes, associated with tissue changes in the brain or the blood vessels supplying the brain, are the conditions encountered most frequently in geriatric psychiatry. The causes of the changes are unknown. Current therapy, aimed at amelioration of symptoms, has not been markedly successful. Prevention awaits clarification of the causes.

The high incidence among the aged of psychoneurotic reactions, especially depression, has recently received increased attention. Predisposing personality patterns, stresses such as loss of self-esteem, being thrust into a role of decreasing value to others, and increasing social isolation have been indicted as causative. Effective treatment calls for exacting analysis of the interrelationships of these factors.

Restoration of Vision

brief

From an aged person's point of view, the last 6 months of life may be the most precious. And as disabilities and disease confine his movements, his sight becomes more important than ever. At the Home for Aged and Infirm Hebrews in New York City, we endeavor to maintain the vision of our residents at the highest possible level.

Almost every resident needs eyeglasses. Prescribing them, however, sometimes requires patience, persistence, and the use of nonsubjective techniques. For example, one patient, viewing a chart through two different lenses, when asked which one was better, replied, "Neither." Such questions and answers may continue for 10 minutes, because it is sometimes difficult to penetrate an aged person's consciousness. But unless a satisfactory examination is made, a possible 20/40 vision may be adjusted only to 20/70.

Surgery is necessary to preserve the vision of some residents. Failure to use surgery for the aged is often excused by vague statements about the patient's age, the fact that he hasn't much longer to live, and that he shouldn't be bothered with the pain and suffering of an operation. This thinking is often based on an erroneous concept of the ability of the aged to withstand surgical trauma with reasonable safety. This ability is demonstrated, I believe, by our experience with ocular surgery for residents of the home.

I have reviewed 118 major eye operations performed over a 15-year period on a series of patients aged 65 to 94 years. Seventy patients were in the age group 75–84 years; 28 were in the age group 65–74 years, and 20 were in the age group 85–94 years. Most of the operations were for cataract extraction (85) or for glaucoma after medication had failed (18). The remainder were for a variety of conditions.

Based on a paper by Morris Feldstein, M.D., department of ophthalmology, Home for Aged and Infirm Hebrews, New York City.

The most frequent contraindication for surgery was a psychotic state in which the patient was unmanageable or likely to be unaware of his visual status. However, this condition is open to question. In the past, when both eyes were covered following a cataract operation, the patient frequently developed a postoperative psychosis with disorientation and loss of contact with reality. When the unoperated eye was uncovered, the psychosis disappeared. It is possible that the psychosis of a blind, psychotic person may have been induced by the onset of blindness, and restoration of vision may improve his mental state.

Another contraindication was the patient's lack of desire for surgery. However, if glaucoma or a hypermature cataract was likely to cause irreversible damage, we have strongly urged the patient to undergo surgery. Usually he follows this advice. The interplay of vision and mental health must be considered critically. An old man's apparent satisfaction with failing vision may actually stem from a depressed state brought on by subconscious fears of impending blindness. He may really need forceful encouragement to undergo an operation.

When surgery was needed, we considered many serious medical conditions as deterrents rather than absolute contraindications. These included hypertension (62 patients), arteriosclerotic heart disease (30 patients), general or peripheral arteriosclerosis (30 patients), pulmonary emphysema (16 patients), and diabetes mellitus (11 patients). Each case was discussed and evaluated individually by the medical staff, and because each operation was a calculated risk, the patient's demand for vision was often the deciding factor.

One 83-year-old's experience is enlightening. He had bilateral cataracts, but the medical staff was reluctant to permit surgery because he suffered from left-sided heart failure, pulmonary emphysema, hypertension, epidermoid carcinoma of the vocal cord, chronic cholecystitis, and severe orthopnea. When he threatened to commit suicide if nothing was done to restore his vision, the medical staff reluctantly agreed to ocular surgery. His medical condition showed no deterioration as a result of the operation, and 4 weeks later he was fitted with glasses giving him 15/30 vision in the right eye. Although he lived only 8 months longer, those months were brightened by his ability to see.

There were limited goals for the operations, particularly those for cataract or glaucoma. As a result of the cataract operations, 84 percent of the eyes showed vision of 15/70 or better, sufficient sight to enable the patients to take care of themselves. Most of them had a return of useful central and peripheral vision, although central vision was defective in some instances by reason of their particular eye lesions. The patients with glaucoma were not numerous enough to draw any conclusions regarding surgical techniques or visual results.

Both general and ocular postoperative complications were studied. One hundred and eight patients had no general complications. Six had acute postoperative psychoses. One suffered pulmonary infarction and another had a myocardial infarction and recovered. Two patients died, one with congestive heart failure after 14 days and another with acute myocardial infarction on the second postoperative day.

Twelve patients had ocular postoperative complications, but 10 of these eventually recovered. Two lost vision of the eye completely, one because of infection and the other because of corneal degeneration.

The small number of postoperative complications supports the opinion that many aged persons can undergo ocular surgery. Despite the risks, older persons stand to gain much by the restoration of their vision.

Environmental Stresses

brief

We have no definite information as to how and to what degree people of various ages respond to stresses of heat and cold. However, there are some suggestive bits of information as to whether environments per se cause the stresses in older persons that we anticipated in the past.

The traditional concept that older people are less tolerant of heat appears to be borne out by one piece of experimental evidence. There

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Based on a paper by Steven M. Horvath, Ph.D., head, department of physiology, Lankenau Hospital, Philadelphia.

Safety Hints for the Elderly

Household aids and personal practices which help to prevent accidents are described in a series of folders, "Safety Hints for Elderly Persons," published by the National Safety Council. Titles in the series are "Poor Eyesight?" "Tire Easily?" "A Little Shaky?" and "Forget Things?" Each 4-page folder is 3½ by 8 inches and illustrated in four colors.

Professional workers providing services for elderly persons can obtain single sample sets. For price information and sample set, write the National Safety Council, Home Department, 425 North Michigan Avenue, Chicago 11.

was a striking contrast in the responses of young and old persons exposed to a dry temperature of 100° F. and a wet bulb temperature of approximately 72° F., an environment not uncommon in the United States. Young people 18 to 24 years of age responded with perspiration in quantities sufficient to maintain body temperatures at normal levels. If they remained quiet, they suffered no ill effects, but if they stood erect for 5 minutes or more, approximately 40 to 50 percent had a syncopal response.

Those in the age group 60–80 years did not perspire as readily as the younger persons; their body temperature tended to rise more rapidly, and if they stood erect in the heat, their tendency for syncope was much greater. This suggests that tolerance of heat diminishes as a person's age increases. The intricacies of this phenomenon remain unelucidated and require considerable additional investigation.

More surprising was the difference in the responses of young and old to a temperature of 10° C., or approximately 48° F. In this experiment the subjects were nude. In 8 to 11 minutes, the 20- to 30-year-olds started shivering violently. They shivered at a rate and intensity equivalent to doing mild work, in the category of 700 kilometers per minute. In a cold environment this is a fairly significant stress.

The 65- to 85-year-olds failed to start shivering after 40 to 45 minutes. Only 1 older person in 10 responded with an increase in metabolism. This relative lack of response was accompanied by little or no increase in the production of heat by the body, whereas the younger people responded with a threefold to fourfold increase in their metabolic heat production.

Whether the response of the older group indicates failure or better adjustment is an unanswered question. However, it raises a number of speculations as to the mechanisms by which the human organism is able to respond to different environmental stresses.

Loss of Hearing

More older people suffer from defective hearing than from heart disease, paralysis, joint diseases, tuberculosis, or cancer. Everyone, if life is long enough, suffers from presbyacusis, a progressive loss of hearing (peripheral, central, or cortical, and either continuing or intermittent) caused by failing functions in the neural apparatus of hearing.

However, presbyacusis can begin at or even before the age of 30 years.

Many excessive stresses may precede the onset of presbyacusis—recurrent and continuing strains from emotional episodes; drugs such as quinine and the salicylates; tobacco, coffee, tea; some alkaloids and antibiotics; overexertion; bacterial and viral infections; acoustic, psychic, and other traumas; electric shock; endocrine and metabolic disorders; pregnancy; vitamin deficiencies; hyperoxia and hypoxia; exposure to cold; allergies; thromboses and vasospasms. But unless a hearing loss is progressive and without apparent, immediate cause, it should not be called presbyacusis.

It is difficult to determine when presbyacusis begins, but when is it well established, the patient or his family may diagnose it.

Presbyacusis must be primarily due to deficiencies in metabolism, in supply or proper disposal of waste, or both. Many years ago Prof. Ernest Glen Wever of Princeton, N.J., demonstrated experimentally how the hearing

Based on a paper by Edmund Prince Fowler, M.D., chairman, central bureau of research, American Otological Society.

of animals was affected by various degrees of anoxia. In my opinion, intravascular clumping or agglutination of the blood and its effect in lowering the supply of oxygen is one of the most important factors in the aging process, and notably, in the aging of the auditory apparatus.

The caliber of the smallest blood vessels, the capillaries, is just about the diameter of one red blood cell, so that even if two or three cells are clumped, they will have to be pushed through with more speed than normal to release sufficient oxygen. If two blood cells are stuck together, 50 percent of their surfaces will not be functioning. If 10 are stuck together, 90 percent of their surfaces will not function.

We do not know why blood cells do not always stick together. The cells, like all proteins, are sticky and certainly blood plasma is sticky. However, we do know that we can cause experimentally an intravascular clumping of the blood by slowing circulation sufficiently, especially in the arterioles and arteriolar capillary sphincters. We know that the blood cells have a higher specific gravity than the plasma and that the impedance of flow causes the cells to settle to the bottom of horizontal vessels and to stick together in masses.

Clumping or sludging of blood is universally present in varying degrees in the aging adult. Abnormal vascular functioning depends somewhat on inheritance, as influenced by environment, but especially on emotional reactions. In my opinion, this abnormal functioning is not usually precipitated by stress alone, but by excessive stress, which is strain.

There is no sure way to avoid presbyacusis. Short of being able to choose our parents, the most important steps are to avoid exposures to excessive noise, violent explosions, traumas, infectious diseases, poisons, and to lessen the strain of severe emotional episodes.

The otologist now has drugs which, if used in time, can help to prevent certain types of otherwise permanent neural deafness, which even though moderate in the first decades of life, can set the stage for earlier onset of presbyacusis than would otherwise be expected. Means of diminishing intravascular agglutinations of blood also exist; however, the more powerful drugs cannot be used indefinitely.

Because loss of hearing in older people is always partly due to neural lesions, they do not respond well to amplified sounds. This is because of the presence of recruitment of loudness and recruitment of frequency, which not only make loud sounds louder but distort their timbre, particularly of speech. However binaural hearing aids, if properly manufactured and adjusted to the individual patient, can rehabilitate these persons.

Podiatry for the Aged

brief

It would be safe to assume that the majority of our older citizens have sore feet; L. A. Frost, D.S.C., of Monroe, Mich., estimates that 85 percent have foot disorders.

The feet of the aged are susceptible to injury because of some degree of insensitivity to heat and cold, retarded healing of poorly nourished tissues, loss of the fat padding the soles, and the thinning of skin on the toes. Also, because most aged persons have chronic, progressive, or degenerative disorders, they are likely to have a predisposition to gangrene. Therefore any blister, bruise, abrasion, or cut should be a cause of concern.

Proper foot care is particularly important for persons with diabetes and vascular disease. At Cincinnati General Hospital, 15 podiatrists under Louis G. Hermann, M.D., care for the feet of patients with these diseases. When this service began 12 years ago 22 to 24 amputations per month were performed; now the number has decreased to between 2 and 4 per month.

Hospitals and nursing homes have found that prophylactic foot care for their patients contributes to the well-being of the whole person. Precisely made and fitted footgear and appliances and devices to redistribute weight stress often enable patients to move about readily and they are more easily motivated toward rehabilitation. Proper foot care can also lessen the possibility of additional podiatric, medical, or surgical care for the patient and reduce the amount of institutional care and expense.

Based on a paper by Edward L. Tarara, D.S.C., Mayo Clinic, Rochester, Minn.

Nursing Service in Homes for the Aged

FRANZ GOLDMANN, M.D.

THE FUNCTIONS of homes for the aged have changed profoundly with the passage of time. In the old days provision of room, board, and some personal care was the major concern, and arrangements for medical and nursing services were incidental. In recent years, systematic provision of all personal health services required by the residents has come to play an increasingly important, often dominating, role. Acceptance of new responsibilities was a matter of necessity rather than choice for the homes. It was prompted by the marked increase in the number both of infirm elderly people seeking admission and of residents beyond 80 years who were physically or mentally declining during their long stay in the home.

This process of readjustment of functions is likely to continue and spread in the near future. As a result, more and more homes for the aged will become nursing homes in fact and be confronted with the complex problem of proper organization of personal health services. Good nursing service is of course essential to the humane, effective, and economical care of the people living in homes for the aged. What type of nursing personnel should be employed? How many employees are needed to serve a given number of residents? How many professional nurses, practical nurses, and nurse aides should be on the staff of a home of a certain size? These are practical questions begging to be answered.

"To speculate without facts is to attempt to enter a house of which one has not the key," as Julian Huxley once remarked. What is necessary for sound action is examination and evaluation of the policies and experiences of large numbers of homes. Such an inquiry has been made in connection with a series of studies on coordination of health services for patients with long-term illnesses. The project is sponsored by the Council of Jewish Federations and Welfare Funds, New York City, and supported by a grant from the Division of Hospital and Medical Facilities, Public Health Service.

This report presents findings on nursing personnel in 70 Jewish homes for the aged in 51 cities of the United States and Canada and, from another study, data on the amount of nursing service actually given to 530 residents of five homes. Observations on other types of service have been published elsewhere (*1*).

Nursing Personnel

Information on nursing personnel was collected from the 70 Jewish homes for the aged through detailed questionnaires. This material was supplemented by field studies of 11 of these homes.

Most of the 70 homes employ regular staffs composed of a great variety of persons with special skills, maintain special units for the ill and infirm, and have more or less definite arrangements with general hospitals for inpatient and outpatient care of those residents who cannot be treated in the home. Many possess diagnostic and therapeutic equipment of

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Marta Fraenkel, M.D., director of medical statistics service, New York City Department of Hospitals, and Lily P. Silbert, research assistant to the director of the council's health study, assisted in analyzing the data provided by the various institutions.

various types. Several homes have more or less definite arrangements with general hospitals for regular utilization of certain of their facilities, such as clinical and radiological laboratories, and for the services of members of their medical staffs at the homes.

In 1957, nursing personnel were regularly employed by all 70 homes, which contained a total of 11,148 beds. Professional nurses accounted for one-eighth of the total nursing personnel, practical nurses for one-third, and nurse aides and attendants for more than one-half (table 1).

The staffing pattern varied widely among homes of different sizes. Professional nurses were employed in 60 homes. They were lacking in the three homes with fewer than 25 beds but were available in 8 of the 13 homes in the 25- to 49-bed category, in all but 2 of the 36 homes with 50 to 199 beds, and in all the 18 larger institutions. The proportion of professional nurses in the 60 homes declined with increase in bed capacity; it ranged from a high of 21.7 percent in the small homes to lows of 8.7 and 7.8 percent in the largest homes.

Practical nurses, on the staffs of all 70 homes, constituted the great majority in the homes with fewer than 25 beds, but they were in the minority in the homes with 50 beds or more. Use of nurse aides and attendants was relatively uncommon in homes with fewer than 50 beds but increased in frequency in the larger homes.

In all homes with more than 100 beds more than one-half of the nursing personnel were nurse aides and attendants and less than one-third were practical nurses. Conversely, at the smallest homes practical nurses made up the majority and nurse aides the minority.

For quantitative measurement, the number of nursing personnel was related to the number of beds. This method was chosen because pertinent data were easily available, and the figures for beds could be presumed to differ little from those for days of care because of high average occupancy of the homes.

The total nursing personnel employed by the 70 homes in 1957 averaged 19.7 per 100 beds, a ratio of one nurse to five beds. This figure, however, conceals exceedingly wide variations. Five homes employed more than 30 nurses and aides per 100 beds, while eight homes had fewer than 10 per 100 beds (table 2). Both high and low rates were observed in each of the categories, but as a group the smaller homes compared unfavorably with the larger ones. Of the 33 homes with fewer than 100 beds, only 9 met or exceeded the average of one nurse to five beds, whereas 17 of the 37 homes with more than 100 beds did so.

The number of professional nurses employed by 60 homes averaged 2.4 per 100 beds. The rate was lowest (1.6) in the two homes in the 400- to 599-bed category, where professional nurses constituted 7.8 percent of the total nurs-

Table 1. Nursing personnel in Jewish homes for the aged, by specified size of homes, 1957

Bed capacity [1]	Total number homes	Total number beds	Nursing personnel							
			All types		Professional nurses		Practical nurses		Aides and attendants	
			Number	Percent	Number	Percent	Number	Percent	Number	Percent
All homes	70	11, 148	2, 196	100. 0	261	11. 9	731	33. 3	1, 204	54. 8
Under 25	3	65	13	0. 6	0	0	9	69. 2	4	30. 8
25–49	13	517	83	3. 8	18	21. 7	43	51. 8	22	26. 5
50–99	17	1, 160	192	8. 7	31	16. 1	80	41. 7	81	42. 2
100–199	19	2, 793	515	23. 5	66	12. 8	158	30. 7	291	56. 5
200–399	14	3, 741	650	29. 6	83	12. 8	202	31. 1	365	56. 1
400–599	2	938	192	8. 7	15	7. 8	57	29. 7	120	62. 5
900 and over	2	1, 934	551	25. 1	48	8. 7	182	33. 0	321	58. 3

[1] No homes with 600 to 899 beds.

ing personnel. It was highest (3.5) in the 13 homes with 25 to 49 beds, where professional nurses made up 21.9 percent of the nursing staffs. A ratio of at least one professional nurse to 50 beds was achieved by 16 of the 33 homes with fewer than 100 beds and by 20 of the 37 larger homes (table 2).

Theoretically, the size of the nursing staff can be expected to depend largely on the extent of provisions for care of ill and infirm persons in special units such as infirmaries or hospital divisions. At the 70 homes studied, 4,555 beds, or 40.9 percent of the total, were specifically designated for service to chronically ill or substantially disabled residents. Most of these beds were in larger homes: nine-tenths in homes with 100 beds or more and almost seven-tenths in homes with 200 beds or more. Furthermore, the proportion of beds in special units of large homes greatly exceeded that in small homes (table 3).

Number of nursing personnel and proportion of beds in special units were found to be correlated, as expected. Nineteen of the thirty-five homes maintaining 30 percent or more of their total beds in units for ill persons had nursing personnel averaging 20 or more per 100 beds; 16 of these homes employed 3 or more professional nurses per 100 beds. In contrast, only 7 of the 35 homes with less than 30 percent of their beds in special units had such rates (table 4).

Table 3. Percentage of beds in units for ill persons, Jewish homes for the aged, by specified size of homes, 1957

Bed capacity	Total number beds	Beds in special units	
		Number	Percent
Under 50	582	70	12.0
50–99	1,160	330	28.4
100–199	2,793	1,007	36.1
200–399	3,741	1,492	39.0
400 or more	2,872	1,656	57.7

If nurse power rather than proportion of beds in special units is taken as the measure, an equally revealing picture emerges. Four of the five homes employing 30 or more nurses and aides per 100 beds assigned 20 percent or more of their total bed capacity to special units, 50 percent or more in two large institutions, 30 to 39.9 percent in a medium-sized home, and 20 to 29.9 percent in a small home. The eight homes with fewer than 10 nurses and aides per 100 beds included three without regularly assigned beds for the sick.

The median number of nursing personnel per

Table 2. Nursing personnel rates in Jewish homes for the aged, by specified size of homes, 1957

Number nursing personnel per 100 beds	Total number homes	Number homes with specified bed capacity				
		Under 50	50–99	100–199	200–399	400 and over
All homes	70	16	17	19	14	4
All nursing personnel						
Under 10	8	1	2	3	2	0
10.0–14.9	17	5	3	5	4	0
15.0–19.9	19	5	8	2	3	1
20.0–24.9	13	2	2	5	3	1
25.0–29.9	8	2	2	2	1	1
30 and over	5	1	0	2	1	1
Professional nurses						
None	10	8	1	1	0	0
Under 1	7	1	0	3	3	0
1.0–1.9	17	0	7	4	3	3
2.0–2.9	13	3	2	4	4	0
3.0–3.9	12	0	5	4	2	1
4.0–4.9	9	3	1	3	2	0
5 and over	2	1	1	0	0	0

100 beds for each of the categories of homes is shown in the chart. For all nursing personnel, the medians for homes with 400 or more beds and those with 100 to 199 beds, which together provide one-half of the total beds, meet or exceed the ratio of one to five beds. The medians for professional nurses in the categories 50–99, 100–199, and 200–399 beds amply match the ratio of one nurse to 50 beds. Practical nurses and nurse aides play a dominant role in all homes but especially in the smallest and largest.

Nursing Service

Intensive case studies conducted at five Jewish homes for the aged in Chicago, Miami, Philadelphia, St. Louis, and Toronto yielded detailed information on all personal health services received by 530 residents at certain periods of 1958. The study teams consisted of physicians, nurses, social workers, and administrators on the staffs of the homes. The following summarizes the findings on nursing service, based on detailed reports of the directors or supervisors of nursing, all experienced professional nurses.

To see the situation in proper perspective, two general observations must be kept in mind.

Table 5. Nursing service received by patients in units for ill persons in four Jewish homes for the aged, 1958

Daily hours of nursing service	Persons receiving specified hours of nursing service	
	Number	Percent
All homes	206	100.0
Less than 1	71	34.5
1 to 2	57	27.7
2 to 3	14	6.8
3 to 4	42	20.3
4 or more	22	10.7

First, almost all residents were in ill health, suffering from multiple chronic ailments, and many were substantially disabled. Mental impairment with symptoms of temporary or continuous confusion was the most common affliction, and marked emotional disorders were widespread. Second, 45 percent of all the persons in the study group were in a unit for ill persons, such as an infirmary or a hospital division, and of these patients seven-tenths were mentally confused and one-fifth incontinent (*2,3*).

At the time of the study, 9 in every 10

Table 4. Nursing personnel rates in relation to percentage of beds in units for ill persons, Jewish homes for the aged, 1957

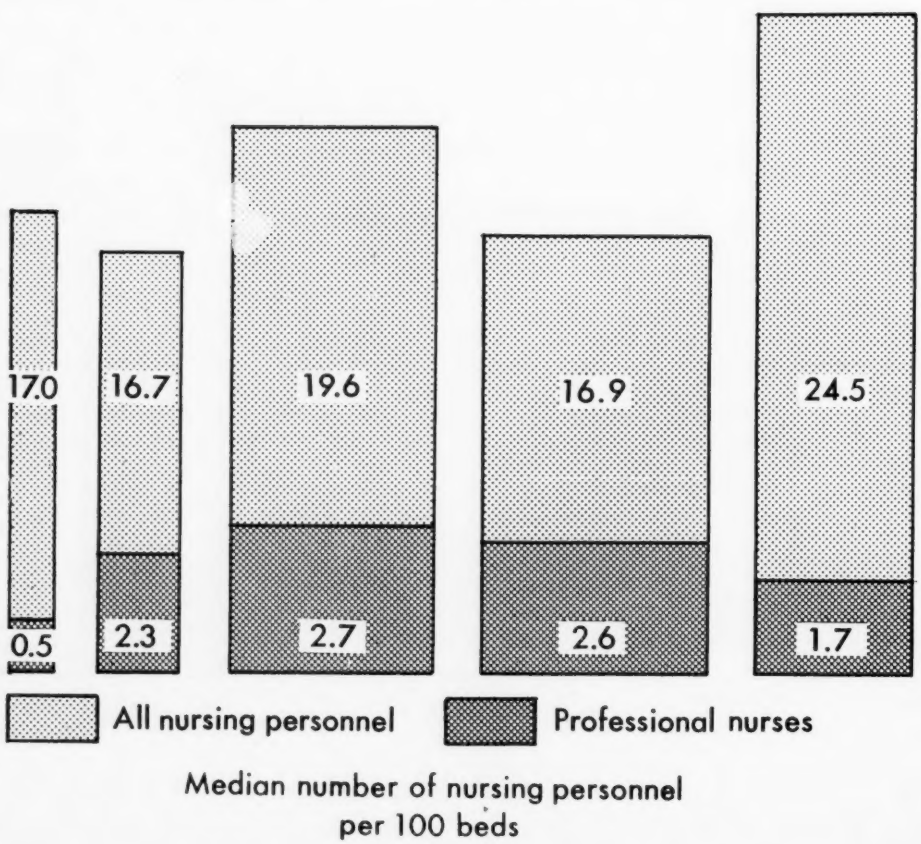
Number of nursing personnel per 100 beds	Total number homes	Number homes with specified percentage of beds in units for ill persons					
		None	Under 20	20.0–29.9	30.0–39.9	40.0–49.9	50 and over
All homes	70	11	7	17	10	10	15
All nursing personnel							
Under 10	8	3	2	1	1	1	0
10.0–14.9	17	4	2	8	1	0	2
15.0–19.9	19	3	2	3	4	4	3
20.0–24.9	13	0	0	3	2	3	5
25.0–29.9	8	1	0	1	1	2	3
30 and over	5	0	1	1	1	0	2
Professional nurses							
None	10	5	1	3	1	0	0
Under 1	7	1	1	2	1	0	2
1.0–1.9	17	1	2	5	2	2	5
2.0–2.9	13	0	2	5	1	3	2
3.0–3.9	12	1	0	1	2	4	4
4.0–4.9	9	2	1	1	2	1	2
5 and over	2	1	0	0	1	0	0

persons in the residential units of the homes were receiving nursing service, the great majority less than 1 hour a day, every eighth person from 1 to 2 hours, and a few a larger amount. Three homes provided such service for every resident, one for more than 8 in 10, and one for more than 5 in 10. The proportional distribution of hours of nursing differed from home to home. At one extreme, one home reported less than 1 hour of nursing for each resident receiving such care, who constituted about one-half of the persons in the residential unit. At the other extreme, two homes, which gave nursing service to every person in the residential unit, reported less than 1 hour for three-fourths of the residents and more for the remainder.

In examining the situation in the infirmaries or similar units for ill persons, the home in Toronto had to be excluded because of its unusual organization. In the other special divisions the average amount of nursing service ranged from less than 1 hour a day for every third patient to 4 hours or more for every ninth. More than one out of four patients was receiving 1 to 2 hours of such service, and almost the same proportion, between 2 and 4 hours. Those requiring 2 hours or more of nursing service a day constituted close to four-tenths of all infirmary patients studied, and those requiring 3 hours or more made up almost one-third (table 5). There were substantial variations among the homes with regard to the proportional distribution of nursing time. One home

Median number of nursing personnel per 100 beds in homes of specified size, Jewish homes for the aged, 1957

Bed complement	under 50	50-99	100-199	200-399	400 and over
Total beds	582	1,160	2,793	3,741	2,872



furnished less than 1 hour of nursing service to every other person in the infirmary and 4 hours or more to only a few patients. At the other extreme, one home reported less than 1 hour of nursing for very few persons but 4 hours or more for four-tenths of the patients in the infirmary.

Discussion

The policy followed by the homes for the aged in building up their nursing staffs reflects recognition of three facts: (*a*) almost every resident needs some nursing care at some time; (*b*) numerous residents require continued nursing service in substantial amount over long periods of time; and (*c*) much of the service can be given by practical nurses and nurse aides under the direction and supervision of professional nurses. As the findings from the two studies show, the size of special units for the sick and the type of patients in these units strongly influence the quantity of nursing personnel in the homes.

The average ratio of one nurse or nurse aide to every five beds in the 70 homes is encouraging. If nothing else, it proves at least the possibility of attracting nursing personnel to places shunned in the past. Taken in conjunction with findings on other types of health personnel active in the homes, the development of nursing staffs can be regarded as part of a movement toward a constructive approach in place of passive acceptance of the ailments of old age.

Impressive as the picture of the average situation in all 70 homes is, it is marred by the differences between individual homes. Of course, some disparity must be expected and is justified. But the variations in the supply of nurse power are too wide to be ignored. For instance, the number of nursing personnel per 100 beds ranged from 7.7 to 30.4 in the 17 homes assigning between 20 to 30 percent of their beds for the care of the sick and infirm and from 13.4 to 31.6 in the 15 homes using one-half or more of all beds for this purpose. Such differences can be explained but hardly excused.

Constant supervision of the numerous mentally confused residents and systematic care of the many incontinent are responsibilities taxing the strength and temper of the personnel. Yet, these are only some of the countless duties to be carried out for those patients in the special units who need regular attention for many months, if not several years. Moreover, administration of medications, such as tranquilizers, care of the skin to prevent bedsores, and help in eating, bathing, and general personal care are functions to be performed for the majority of the elderly people in the residential units as well as for all those in the units for ill persons. Above all, the "therapy of friendship" for the numerous elderly people with marked emotional disorders requires patience, prudence, and perseverance—and the time for it.

Employment of professional nurses as well as other personnel with different degrees of skill is the rule in 60 of the 70 homes. The general tendency is to employ relatively few professional nurses and to rely heavily on practical nurses and nurse aides and attendants. Unquestionably, division of responsibility according to functions is a widely accepted principle. In most instances, the professional nurses direct, supervise, and coordinate the nursing activities and limit direct service to therapeutic procedures requiring high skill or involving great responsibility. In some instances they give regular bedside care as well. According to my observations in a number of homes, this policy has worked satisfactorily, although it has not led to the disappearance of the harassed professional nurse. Yet, fundamental problems warrant mention.

Satisfactory delineation of the functions to be performed by professional nurses, practical nurses, and nurse aides is not easy. Division of responsibility is of little avail unless accompanied by unification of effort. To meet the nursing needs of individuals fully, proper service must be available when and as long as required. Of paramount importance is individualizing service according to the resident's physical ability, mental capacity, temperament, and, in particular, the degree of ability to follow the daily routine of the average healthy person. This implies not only agreement on the functions to be performed by the various types of nursing personnel but also development of methods of direction and supervision that will stimulate

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recognition and foster acceptance of interdependence without stifling independence.

It is simple to state that nursing care should be provided at the least cost compatible with quantitative and qualitative adequacy. Unfortunately, there are no standards derived from practices of proved value that can be used to appraise the adequacy of the nursing personnel in individual homes. What is a satisfactory ratio of total nursing personnel to beds? Proportionately how many professional nurses are required for attainment both of humane and effective care of the residents and of efficient operation of the home? These are still wide open questions. In the search for solutions some help may be gained from the patterns found by this study in homes of various sizes, as shown in the chart. The homes with the largest nursing staffs employ one nurse for about four beds and those with the next largest staffs have one nurse for every five beds. This policy is all the more significant as it is followed by homes containing 50.8 percent of all beds in the 70 homes. The observation that one professional nurse for approximately 50 beds is available in all but the smallest homes may also be meaningful.

The tables on nursing personnel intentionally relate data on personnel to beds in the homes. Is this the most dependable method of measurement? In studying this question it was found that in 1957 two homes, containing a tiny proportion of all beds, were occupied in excess of their official bed complements and that 24 homes, containing one-fourth of all beds, for a variety of reasons had less than 90 percent occupancy, the average being 76 percent. In view of this observation all data on nursing personnel were also related to the total number of days of care actually provided during the year (table 6). On the basis of this calculation more homes could be classified as relatively well supplied with nursing personnel, and more homes move up into the top bracket. If confirmed by other studies, this finding would mean that the method of using beds as the unit of measurement is good for general purposes, but the method of using days of care is preferable for determination of the relative position of categories of homes.

It would be valuable to compare the provisions for nursing personnel at the 70 Jewish homes for the aged with those in Protestant, Catholic, and nonsectarian homes for old folks. For the time being, this is impossible owing to lack of large-scale studies of these homes. All that can be done at present is to examine the situation at other types of homes serving mainly elderly persons with chronic illness or serious impairment of physical or mental function.

In connection with the inquiries into the problem of coordinating health services for patients with prolonged illness, detailed data on nursing personnel were obtained in 1957 from six Jewish institutions classified as homes for the chronically ill and disabled and from eight Jewish facilities classified as chronic disease hospitals. Comparison of nurse power in these facilities with that in homes for the aged reveals similarities as well as differences (table 6).

Table 6. Comparative rates of nursing personnel in three types of institutions for long-term care, 1957

Type of institution	Total number institutions	Average rates of nursing personnel					
		All types		Professional		Practical and aides	
		Rate per 100 beds	Rate per 100 days of care	Rate per 100 beds	Rate per 100 days of care	Rate per 100 beds	Rate per 100 days of care
Homes for the aged	70	19.7	21.4	[1] 2.4	[1] 2.6	17.4	18.9
Homes for chronically ill	6	40.0	42.2	4.5	4.7	35.5	37.5
Chronic disease hospitals	8	44.2	53.0	10.1	12.1	34.1	40.9

[1] Refers to 60 homes employing professional nurses.

In the six homes for the chronically ill and disabled, professional nurses accounted for 11.2 percent, practical nurses for 30.9 percent, and nurse aides and attendants for 57.9 percent. Thus the proportional distribution of the various types of nursing personnel was about the same as in the homes for the aged. However, there were significant differences in the amount of nurse power. The rates for both total nursing personnel and for professional nurses in homes for the chronically ill and disabled were twice those in homes for the aged.

To interpret this finding several facts must be kept in mind. The age composition of the populations of the two types of institutions is quite similar. Almost all the residents remain in the homes to the end of their days. Practically all the people in homes for the chronically ill and disabled require much, and often continuous, nursing service because of the severity of their impairments, but more than one-half of those staying in the homes for the aged are able to live in residential units and, except for a few, need only some nursing service from time to time. Thus the findings on nurse power in the two types of institutions seem to correspond remarkably well.

Quite different is the situation in the eight chronic disease hospitals. There professional nurses made up 22.8 percent of the staff, practical nurses accounted for 15.3 percent, and nurse aides and attendants for 61.9 percent. Thus the proportion of professional nurses was double that in the two other types of facilities, and the proportion of nurse aides and attendants was somewhat higher. The rate for total nursing personnel in the chronic disease hospitals was slightly above that in the homes for the chronically ill and disabled and more than twice that in the homes for the aged.

In contrast to the homes for the aged and the homes for the chronically ill, the chronic disease hospitals studied are designed for active treatment of patients with seriously disabling long-term illness. They discharge a substantial number of patients after a few months of intensive treatment and, accordingly, use their beds for an average of more than one patient during a year. Because of their particular functions, the chronic disease hospitals need a relatively large nursing staff and must place greater emphasis on use of professional nurses. As a study of 527 patients in four chronic disease hospitals in four cities revealed, one-half of the patients actually received from 2 to 4 hours of nursing service a day during their first week in the hospital and one-fifth required 4 hours or more.

Like the homes for the aged studied, proprietary nursing homes serve a group of people characterized by an average age of 80 years and high prevalence of mental confusion and incontinence. Yet their provisions for skilled nursing personnel compare unfavorably with those of the homes for the aged, if the test is applied to the two types in their entirety rather than to individual homes. One out of three proprietary homes in 13 States studied during 1953–54 by the Public Health Service and the Commission on Chronic Illness had neither a professional nor a licensed practical nurse on the staff. Professional nurses were available in only two out of five homes and practical nurses were the persons with highest skill in one out of four homes (*4*). The great majority of these homes, however, had fewer than 25 beds in contrast to only 3 of the 70 Jewish homes for the aged.

A study made in the State of Washington in 1956 gives insight into the staffing pattern of 300 licensed nursing homes and homes for the aged, with a total of 9,122 beds. Professional nurses accounted for one-fifth, practical nurses for close to one-fifth, and nurse aides for more than three-fifths of the total nursing personnel. Compared with the 70 Jewish homes for the aged and the 6 Jewish homes for the chronically ill, the facilities in Washington had larger proportions of both professional nurses and nurse aides and a much smaller proportion of practical nurses (*5*).

Summary

The organization of nursing service was studied in 1957 at 70 Jewish homes for the aged, and the amount of nursing service actually given was determined in 1958 for 530 residents of five Jewish homes for the aged.

Professional nurses made up one-eighth of the total nursing personnel in the 70 homes, practical nurses one-third, and nurse aides and

attendants more than one-half. Professional nurses were employed by 60 of the 70 homes. The proportions of both professional nurses and practical nurses declined and that of nurse aides and attendants grew larger with increase in the size of the homes.

The ratio of all nursing personnel to beds in the 70 homes averaged 1:5 and that of professional nurses to beds in the 60 homes averaged 1:40. Both ratios varied markedly among homes of different size. They were relatively high in the majority of homes with more than 100 beds and in the minority of all smaller homes. Best supplied were the homes with 400 beds or more and the homes in the 100- to 199-bed category, which together contained one-half of all available beds. Homes with 100 to 399 beds, which provided almost three-fifths of all beds, led in employment of professional nurses.

The size of the total nursing staff was closely related to the proportion of beds in units for the care of ill and infirm residents.

At the five homes where case studies were made, 9 out of every 10 persons in the residential units were actually receiving nursing service, mostly less than 1 hour a day. In the units for ill persons more than one out of every four persons was receiving 1 to 2 hours of nursing service and an equally large proportion from 2 to 4 hours. Almost 4 out of every 10 infirmary patients studied required 2 hours or more of nursing service a day.

The policies and experiences of the homes with the largest nursing staffs may be useful in developing standards for both total nursing personnel and professional nurses in those homes for the aged which perform the functions of highly developed nursing homes.

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Health, Education, and Welfare Indicators

A new monthly periodical, *Health, Education, and Welfare Indicators*, is being published by the Department of Health, Education, and Welfare. A handy reference on current developments in the field of human resources, it features up-to-date statistical information on consumer interests, health conditions, population trends, social security, births, deaths, and marriages. Month-to-month changes in a wide range of subjects are reflected in a series of charts and tables.

This publication is intended to supplement the annual "Health, Education, and Welfare Trends," published earlier this year and available at 50 cents a copy.

Copies of *Indicators* may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., at 35 cents each or $3.50 per year ($4.50 per year if mailed to a foreign address).

Health Services at Home

Health services in the home are frequently prescribed for older people as a method of alleviating the strain on overtaxed medical and institutional facilities. For social, economic, and psychological reasons, this form of care is particularly recommended for some patients.

Participants in a symposium held at the National Health Forum in Miami Beach, Fla., March 16, 1960, thoughtfully examined the home care programs, their justification, organization, and future. Following are six papers based on the statements of the symposium participants.

The Nature of Health Services

DAVID LITTAUER, M.D.

Current trends in growth of population are compelling us to review and modify the types of organization for health services presently available.

In 1940 there were 9 million people over age 65; in 1960 there are about 16 million, and projections for 1980 indicate that the number of persons over age 65 will climb to more than 24.5 million (*1*). In this age group are the greatest number of patients with long-term illness.

The proportion of those over 65 in the total population is also expected to increase from 8.76 percent in 1960 to 9.51 percent in 1980. If predictions of breakthroughs in the causes and treatment of such major illnesses as cancer and heart disease materialize, these estimates of numbers and percentages will probably prove to be conservative.

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The reasons for this increase in the over 65 age group have been well documented. They may be found in advances in preventive and therapeutic medicine and surgical techniques, in progress in nutrition, and in explosive trends in fertility.

Greater life expectancy is itself sufficient to increase the incidence of the long-term metabolic and degenerative illnesses among the aging and aged. However, other factors, not part of the biological aging process, also contribute to the incidence of chronic illness. The transition from a rural and agricultural economy to an urban and industrial one has meant economic and social dislocations of the aged, such as reduced employment opportunities, forced retirement from work at specific ages, and increasingly difficult three-generation living (*2*).

The increasing incidence of long-term illness resulting from this combination of scientific, social, and economic factors in modern society is already straining the resources of medical and institutional care presently at our command.

The solution cannot be found merely in

progressive expansion of beds and ancillary facilities in hospitals, nursing homes, and other institutions for inpatient care. The costs of new hospital construction are high; maintenance of hospital facilities is expensive and rising at the rate of 5 to 7 percent or more each year (*3–5*); and institutional facilities usually are least available in areas, such as rural counties, where geriatric populations are large and per capita income is low. Furthermore, institutionalization for long periods results in losses in personal satisfaction, initiative, and creativity. We must look for alternate solutions.

One of these is home care, the systematic provision of medical, nursing, social, and related services to patients in their homes. Home care is not a substitute for hospital services but an intrinsic component of a spectrum of progressive patient care which comprises acute inhospital care (with intensive, intermediate, and self-care nursing elements), long-term inhospital care, outpatient or office care, care in nursing homes and homes for the aged, and care in the home.

Of course, care in the home need not be confined to the aged who are afflicted with metabolic and degenerative illnesses of long duration. Individuals of any age may be treated successfully in their homes. Organized home care services have accepted and have had excellent results in treating patients with acute episodic illnesses, such as bronchopneumonia, or with acute manifestations of long-term illnesses, such as pulmonary tuberculosis or acute rheumatic fever (*6,7*). To date, however, organized home care has been used most to meet the health, social, and economic needs of the aged who are chronically ill.

Home care service may range from the ministrations of nurses in the home, supported by some medical supervision and limited auxiliary services, to a complex of organized services concerned with the total medical, nursing, restorative, and socioeconomic needs of the patient. These more elaborate types of services, organized in a formal administrative structure and sponsored by a hospital, a community agency, or a public health department, offer social casework, physical therapy, occupational therapy, housekeeper and homemaker services, and laboratory and other diagnostic facilities of the hospital, in addition to physician care and visiting nurse service.

Regardless of sponsorship, the programs tend to exhibit certain common elements: a central administrative control responsible for the program and the policies under which it operates; an evaluation team responsible for coordination of services and for screening, review, and discharge of patients; a service team of physicians, nurses, social workers, and others responsible for immediate care of the patient in the setting of his home and family; and supporting in-hospital facilities for patients who need hospitalization. These programs place considerable emphasis on the need for staff conferences, records, reports, and other controls.

Such a structured organization has been found desirable in most of the 40-odd organized programs that have been established since E. M. Bluestone initiated a home care service at Montefiore Hospital, New York City, in 1947 (*8,9*). These programs have served principally welfare and medically indigent patients. All essential participants, including the physician, have been on stipends or have been reimbursed on a per visit basis by the central directing authority. As more experience is gained, and particularly as the base of home care is broadened to include the private patient of the practicing physician, it may be expected that modifications of the rigid pattern of organization will occur.

Although the value of home care is recognized by leaders in health, medical, and hospital fields as a community resource, it has not yet made much impact on the representatives of these professions in the field or on the public. In the 13 years since the Montefiore Hospital project was established, fewer than 50 organized programs have been founded, and 16 of these are under the auspices of one central agency, the Department of Hospitals in New York City. The national caseload has been variously estimated to average 2,000 to 5,000 patients.

The reasons for snail-like development of a health resource that has general approbation are various (*10*). Obstacles to growth include inadequate financing; inertia and even distrust on the part of physicians, hospital administrators, and other professionals; inadequate infor-

mation about costs and other operating data; deficiencies in community organization for health services; inability of many homes to accommodate the patient; and the public's lack of knowledge about home care as a resource. Time, money, research, and leadership of a high degree will be required to overcome these obstacles. Some may never really be solved. For example, how effectively can home care be given to the one older person in five who lives alone, or to the two older people in five who live alone or with persons who are not their children.

Nevertheless, there is evidence that some obstacles are beginning to be surmounted. It is found in such developments as the educational and organizational activities of national professional organizations and local community groups and in the extension of Blue Cross coverage in some localities, such as New York City and Detroit, to include care in their own homes of subscribers discharged from the hospital.

The potentials of home care as a community health resource are so vast that it is incumbent on us to explore every avenue of advance.

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Official and Voluntary Agencies

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Health services in the home are being furthered by official and voluntary agencies at the National, State, and local levels. At the national level, the American Medical Association, American Hospital Association, Blue Cross, Blue Shield, and the Public Health Service have been developing activities in home care.

One of the first tasks of these five groups was to define the term organized home care. At an invitational working conference held in Chicago in April 1960, representatives of these groups, national voluntary agencies, and operators of home care programs agreed on a working definition: A coordinated home care program is one that is centrally administered and provides for coordinated medical, nursing, social, and related services to selected patients at home, on the basis of integrated evaluation and planning.

The definition was the first step in determining the number of existing home care programs, which are currently being inventoried by the five groups. The inventory, an expansion of the one conducted by the American Medical Association in 1956, includes a history of each individual program, description of its services and administrative structure, and the number and types of personnel employed. Because knowledge of the number and kinds of patients receiving home care, length of stay, types of services they receive, and the actual costs of home care is inadequate, a vital part of the continuing inventory in the future will be an annual statistical evaluation of the program in terms of these factors.

From the findings of the inventory and the conclusions of the invitational conference the five groups plan to develop guide materials to

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assist communities that are either contemplating or conducting home care programs.

The Public Health Service, in addition to collecting and disseminating information on home care, has stimulated and supported pilot projects as another source of information for guidance materials. The Service has aided, through Federal formula grants to States, categorical and overall chronic disease programs. Some States in turn have distributed this money to local communities to start home care programs. As in other health activities, the Service, within its traditional relationships with State health departments, has provided consultation, orientation, and training of professional personnel.

On the State level, health departments have assumed several roles. The Kentucky State Department of Health is supporting rural home care services. The North Carolina State Board of Health is partially supporting a demonstration project in Person County, and Ohio and Connecticut are supporting the organization of local home care programs. Other State health departments are training personnel; one example is the New Jersey homemaker service described by Dr. Marian R. Stanford.

Training at the State level has been developed around new concepts in the care of the chronically ill which hinge on the prevention of disability. This has meant orientation to the need for early and intensive medical care for patients with such conditions as strokes, whether they are at home, in hospitals, or in nursing homes.

Localities have many kinds of programs for care at home, ranging from visiting nurse services alone, to multiple home care services, to the formally organized home care program. Local health departments and voluntary health agencies may operate a program, purchase services, or function as consultant or coordinator. Some health departments operate programs that provide physical therapy, occupational therapy, nutrition, and social services as well as nursing services.

In Hartford, Conn., the health department provides the personnel for the home care team. The Person County, N.C., home care program, in its second year as a demonstration, is an example of an organized program in a rural area administered by the health department. Home care services are also being provided in Kentucky and Florida under local health department auspices.

Local health agencies have encouraged and supported these programs by supplying services to another agency that is administering the program. Often, although a hospital administers the program, nutrition services and physical and occupational therapy are purchased from the visiting nurse association or the health department.

Local voluntary agencies have supplied loan closets and materials and equipment for the patients in a home care program. They have also paid for services given to patients with a specific disease such as cancer, tuberculosis, or heart disease.

The local health department's traditional function of identifying facilities and resources in relation to the community's needs also applies to home care. In planning for the chronically ill, home care is frequently considered a top priority need. Of course, the local health department also acts as a catalyst to see that existing programs and services are utilized to the fullest and in a coordinated fashion, expanding them as the need arises or developing new services.

Because I feel that this is a vital and important role, I would like to describe an example of this type of community activity in Guilford County, N.C. In this community a study of the chronically ill by a consultant from the University of North Carolina School of Public Health showed a need for home care for a large proportion of patients. There were also detailed data on individual patient needs and an evaluation of the rehabilitation potential of the individuals, suitability of their homes, and their unmet needs for physical and occupational therapy, dentistry, and other items.

The study is a baseline from which this community is working. A committee consisting of representatives of all interested voluntary and official health agencies has been established. Its task is to develop services and programs for the chronically ill, and the first priority on its schedule is the organization of a home care program.

Organization of the Family

ALBERT F. WESSEN, Ph.D.

For some years there has been emphasis on the family as the essential unit in planning for health services. Thus, epidemiologists talk of the family group as the focus for understanding the patterns of disease distribution in the community, and increasingly we hear of the importance of the family physician within the framework of good medical care. Since the home usually denotes the environmental setting for family living, the development of home care programs in recent years could be considered as a part of the same general trend.

There have been both positive and negative reasons for considering the family as an essential element in the pattern of the health services. Attention to the family comes as a reaction to the abuses of indiscriminate institutionalization and of the fragmentation inherent in specialized attention to purely individual problems. The family has also come to play an important part in medical thinking both because it tends to be the primary group, the common denominator of environmental influences within which "what affects one affects all," and because psychologists and psychiatrists have recognized the tremendous importance of family living in determining the motivations and emotional balance of individuals.

Human organizations can be thought of as cooperative arrangements of a group of persons seeking to accomplish some purpose. Members are arranged in some kind of working order, and each is expected to play his role in the accomplishment of the group's objectives. The structures of organizations may vary greatly. At one extreme there is the overwhelming complexity of a modern government; while at the other is the simple differentiation of typical American family members into the roles of father, mother, son, daughter, brother, and sister.

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The effectiveness of an organization is a function of a number of factors. Some of the most important are (*a*) the members' commitment to common goals, (*b*) their knowledge about means for achieving these goals, (*c*) adequate resources for goal achievement, and (*d*) degree of coordination. In different situations, satisfaction of these prerequisites of organizational effectiveness requires the development of specialized social structures. It is the purpose of this paper to examine how the American family can, with some help, become an effective organization for the care of long-term illness.

The Family and the Health Services

The family as an organization impinges upon the health services in at least four ways when the sickness of one of its members is considered.

First, the family defines the health status of its members to an important degree. When one feels ill, he goes first to the members of his family for confirmation, advice, or help. Most persons are sharply influenced by their wives, husbands, or parents in deciding whether or not to "play the sick role" (*1*)—to stay home from work, to remain in bed, to take medication, to consult a physician. And whether or not one allows family members to influence his decisions about illness with their overt advice, he will be influenced by his perception of their needs and attitudes. The child or grandparent who cannot otherwise win what he feels is sufficient attention from members of his family may be influenced toward playing the sick role by his expectation that "then they'll have to care for me." Or a parent may "refuse to give in," even to pronounced malaise, because he or she fears the consequences of ceasing to play his normal role. Moreover, the kind of family in which one lives determines to a large degree his definitions of sickness and health. The family's socioeconomic and educational position, for example, has been shown by Koos to determine members' ideas about physical health (*2*), and by Hollingshead and Redlich to influence one's perception of mental illness (*3*).

Second, the family provides direct support and care for sick members. The ability of a family to provide a suitable sickroom, to deal with the special needs of a sick person, and to

give him the kind of warmth and support he may need at a time of crisis may spell the difference between home care and otherwise unnecessary institutionalization. Even when the sick person is hospitalized, the presence and support of members of his family may be crucial in motivating him to want to get well (*4*).

Third is the family's support of the sick member's use of professional help. In terms of dollars and cents, this support is obvious (as well as an obvious problem for many families). But family support of its member's use of professional services goes much further. There are the counsel, opinion, and pressure which help motivate the patient to select a physician, keep appointments, develop confidence in his judgment, and follow his advice (*5*). There are the ways in which family members may aid the sick person's therapy at the physician's request. And there is the willingness of the family to reevaluate and reorganize its activities so that the physician's recommendations may be carried out. These kinds of support can be seen most clearly, perhaps, in the family's, especially the mother's, role in caring for children, but they are present in every situation of illness of a family member.

Fourth is the family's adjustment to the results of sickness in the home. Can the family accommodate its activities and goals to the limitations imposed by the sickness of its member? Is there willingness so to do? What of the long pull, when temporary dislocations drag on and on? What of the emotional drain of worry about a loved one's health? Buell and his colleagues (*6*) have documented the fact that in more than half of the hard core problem families of St. Paul, Minn., chronic illness or physical handicap posed continuing adjustments that taxed family resources. It is probable that many of these became problem families because of their inability to overcome the difficulties which sickness imposed.

Some Problems of the Family

When one examines the ways in which the family's organization impinges upon health care for older people, he is struck by the relevance of the organizational criterion of common goals. The question may be put this way: To what extent are our old people solidary members of their families? Although more than three-fourths of persons 65 or older live in families, how many of those who live with children or other relatives are really accepted as wanted dwellers in the home? How many of these families have consensus among their members concerning the style and aims of family living? To what extent is there intergenerational conflict? (We know it tends to be most marked where there are differences in social class or cultural outlook between generations.) In the experience of the Jewish Hospital of Saint Louis, reaffirmed by directors of other home care programs, a fundamental criterion for admission of patients to home care is some degree of acceptance of and concern for the patient as a person by his family. Given this kind of family solidarity, desiderata concerning physical arrangements and personal interrelationships can often be worked out.

Parsons and Fox (*7*) have suggested that the increase in the use of hospitals during this century may be not a function merely of technical advances in medicine, but also of the inability of families to meet the challenge and strain of dealing with illness in the home. Not only have families grown smaller, living space less available for care of the sick, and wives less likely to be regularly in the home, but the responsibility of families to care for the aged and the ill is less clearly defined today than 50 years ago. With the development of hospitals and kindred institutions, the family whose organization lacks solidarity can avoid the difficulties of care for the ill with impunity by resorting to otherwise unnecessary institutionalization. While this may offer such a family a way out of a problem it has no wish to accept, it may also mean for the patient a proof of his rejection by the family.

The kinds of goals families set may also sharply influence their attitude toward professionals in the health services. Myers and Roberts (*8*) have pointed out that the experience of most lower class families is such that they are wary of, if not hostile to, authority figures. Cooperation is likely to be grudgingly given. And the weight of family sentiment in such situations may be in the direction of nonsupport of the patient's contact with health pro-

fessionals, especially if the latter seem not to be undertaking direct physical care.

The family's knowledge concerning means to safeguard health varies with social class, educational level, and age of family members. In general, older families are likely to have less adequate health information than younger ones, and those of lower educational and social class levels are likewise apt to be disadvantaged. Moreover, among all three kinds of families it is likely that there is a particularly great amount of misinformation about the diseases of old age; too often, the warning signs of incipient chronic illness are dismissed with the thought that "he's just getting old." Similarly, not enough is known by lay persons about the degree to which palliative and rehabilitative measures can minimize or overcome some of the handicaps of old age.

Perhaps the family's principal role in promoting health lies in the practice of health-conserving measures. With better knowledge, families could not only help older people conserve their bodily resources more effectively, but could help people of middle age and younger avoid practices, such as allowing a condition of obesity to persist, which are known to foster the development of the chronic disabilities of old age.

Also families often do not know how they can participate in the care of the chronically ill. Frequently, families think that the only alternative to home care is institutionalization. Nor do they always realize how much patients who are unable to play their normal family role depend on the family to make them feel a part of a going concern. Certainly, if the family is to participate in the preservation of the health of its members, it must be given the information that will enable this organization to play its role on the health team.

The family's material resources are often inadequate to support the exigencies of chronic illness. Families, particularly those in the geriatric years when income is typically depleted, may be forced to forgo help that they need because of the cost of necessary medical care. Other resources for the care of sick members in the home are also often lacking. The institution of loan closets, equipment rental services, and similar services under the auspices of hospitals, public health departments, or voluntary health agencies is an increasingly important method of helping families play a real role in the health team.

But the lack of family resources in chronic illness concerns not only the wherewithal to pay for medical care but also the potential significance of reduced income consequent upon the incapacity of a wage earner or the drain of paying for extra help to replace the contributions the sick member normally makes to the family (such as a homemaker to play the role of the incapacitated housekeeper). Making such services available, and helping to finance them as well, can often augment family resources enough to allow the family to provide care at home when otherwise institutionalization would be necessary.

Family personnel resources are often either inadequate to the challenges of chronic illness or become depleted by its demands. The absence of helping hands during a part of the day may make home care impossible. If neighbors can be co-opted to "look in" once in awhile or outside personnel can be brought in, the greater costs of hospitalization may be avoided. Similarly, family members can often acquire the skills needed to help with procedures otherwise requiring professional assistance. Giving injections of insulin to diabetics or helping bedfast patients with routine exercises are typical examples. More important, many families can competently care for the routine problems of family illness if they are assured of swift professional support when emergencies arise or conditions change for the worse. Physicians, with excessive demands on their services, often cannot make home visits readily. More precise arrangements for professional support, such as those established in home care programs, may be required.

Home care of the chronically ill is usually unrewarding, even to the professional, and the slow decline of a loved one is harder to bear than that of a patient. It is thus understandable that the motivation of family members to help in the care of the chronically ill may flag. And, lacking the objectivity of the professional, family members become involved emotionally in the discrepancy between a sick person's reactions and their expectation of that person's

behavior as mother, husband, or son. On both counts, family members often need help in re-evaluating their role and feelings about the illness. Sometimes a willing listener with a few words of wise counsel can spell the difference between a family member who wishes to wash his hands of the care of a chronically ill patient and one who is willing actively to help that patient as a member of the health team.

Finally, there is the task of coordination. Persuading the members of a family or any other organization to pull together efficiently toward a goal is always problematical; when the stress of illness within the family arises, the patterns of coordination which worked tolerably well during health may be shattered. Again, the support and counsel of professionals may help the family not only to adjust actively to the illness, but also to maintain its normal functions.

When illness or other crises require professional help, there is always the question as to whether the advice of the professional counselor can be accepted and coordinated into the family's attempts to solve its problems. This means, among other things, that the professional must understand not only the client but also his family. He must realize that the communication of his advice and of his willingness to help is not a simple process. Coordination in this respect requires a shared understanding and empathy between professionals, patients, and family members. It also requires similar understanding between doctors, nurses, physical therapists, social workers, and others about each other's role and about the situations of the families with whom all work. This is to suggest that understanding may become so difficult that it may require special efforts of coordination if it is to be achieved. The home care team must be carefully organized if it is to be effective in helping families care for the chronically ill in the home.

Conclusion

Providing the services associated with home care programs can solve many of the problems that beset the family organization when it is confronted with the chronic illness of one of its members. However, the family's role in health care transcends the demands that occur with the onset of illness: the family is instrumental in preventing illness, in determining appropriate action when illness strikes, and in supporting the patient's use of professional help.

Members of the health professions can help the family most effectively if they recognize its role and regard the family as the core of the health team in home care.

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Visiting Nurse Service

EMILIE G. SARGENT, R.N., M.S.P.H.

For more than 75 years visiting nurse associations have been caring for the sick in their own homes under the direction of the patient's physician. The Detroit Visiting Nurse Association has had 62 years' experience in the care of patients at home and 4 years' experience with an organized home care demonstration program. Dr. Littauer has explained organized home care programs, and I will try to point out

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the differences between such programs and visiting nurse programs.

Visiting nurse associations are community agencies set up to supply nursing and ancillary health services to patients under the medical direction of the patient's physician. They are an urban development found in most cities of more than 50,000 population and are supported generally by federated financing and fees for services. Visiting nurse associations, like hospitals and health departments, have tried to adapt their services to scientific and social change. For example, the Detroit VNA added physical therapy to its services in 1926, occupational therapy in 1933, nutrition and mental health in 1938, homemaker service in 1955, and medical and social work consultation in 1956. Early emphasis was on maternal and child health and acute disease, but this has shifted in the past 15 years to long-term patients. Today the aged ill comprise about one-third of all patients of the visiting nurse associations.

With the advent of prepaid hospital insurance in 1940, hospitalization became popular. From 1945 to 1955 the Detroit Visiting Nurse Association tried with limited success to develop with hospitals patient referral plans to insure more continuity of care between hospital and home. Too many patients were losing the gains made in the hospital before the visiting nurse was called in. For this reason the VNA became interested in the home care plan of Montefiore Hospital of New York City and asked the council of social agencies to advocate a similar plan for Detroit. Eight years went by and it became evident that if Detroit was to have a home care plan, the visiting nurse association would have to take the initiative. A grant from the McGregor Fund, a local foundation, made it possible to conduct a demonstration for a 4-year period.

The VNA followed the currently accepted pattern for an organized home care program except that only patients of private practicing physicians were admitted, and the team of physician, nurse, and social worker served as consultants and gave no direct patient care. The grant of $25,000 each year paid the expenses of the team and a secretary. The expense of the private physician's care was carried by the patient, while the health services were provided by the community agencies following their own policies of charging or not charging for services.

The Detroit 4-year demonstration resulted in acquainting more physicians and more hospital personnel with the value of home care services because interpretation of the plan was an important part of the responsibility of the team and a representative community advisory committee. A few hospitals set up a system of referring patients to community agencies. Another byproduct of the demonstration was that the team helped the staff of the association improve methods of work and give more rehabilitative services to all its patients.

The limiting factor of the demonstration was the number of patients. The team of 3 could not carry more than an average of 45 patients in the home care demonstration because of the many time-consuming conferences and reports connected with the admission, progress, and discharge of the patients. These 45 were selected from the visiting nurse association's daily caseload of 1,000 long-term patients. The expenses of the team added $1 to the cost of each visit made by the VNA staff to demonstration patients.

The reports of other home care programs indicate that the daily average of patients for most of the 60 plans is under 50 patients. The Detroit home care program served 10 aged patients a day in contrast to 600 in the over 65 age group served by the visiting nurse association. The 10 were selected because they needed multiple services and had social problems, the criteria for admission of a patient to the home care demonstration. It might be inferred that only 10 out of the 600 aged needed the special coordinated services of the home care demonstration team, and for 590, the regular visiting nurse association service was adequate.

In my experience, administering a home care program according to the currently established pattern has pointed up the fact that not enough consideration has been given to the potentials of the more than 700 existing visiting nurse associations and of the thousands of health departments that could establish a home treatment service as the quickest and most economical way of bringing necessary services to the aged in their homes. The majority of aged patients

are under their family physician's care; 90 percent of the aged patients of the Detroit association receive medical care from physicians in private practice.

The hospital must supply the bridge to home care. Every hospital has a responsibility to plan for patients needing continued medical and nursing care after discharge. If the patient has a private physician, he, of course, is captain of the planning team. Hospitals set up certain routine procedures which physicians who bring their patients to that hospital must follow. It would seem that a system of planning for the patient who needs continuing care after hospital discharge could be part of such established hospital policy.

Public hospitals and voluntary hospitals that care for many chronically ill indigent patients may wish to have a home care department to extend services to their discharged patients. However, in my opinion the nonindigent post-hospital patient can be well cared for in the home by the simpler and less expensive method of a centralized system to refer patients to a community agency, such as the visiting nurse association, which will coordinate with other agencies whose services are needed by the patient.

In any event, the community planning and financing bodies should participate in the decision on which kind of home care service is best adapted to their community, because community funds will be needed to finance programs in the hospital and the home.

Community Homemaker Service

MARIAN R. STANFORD, M.D.

In New Jersey, community homemaker service has demonstrated its value as one of the important basic resources for preserving homes threatened by the absence or incapacity of the person who formerly carried the chief responsibility for family care and home management. This service is proving especially valuable in meeting the needs of older persons living in their own homes. Community homemaker service in New Jersey is a locally sponsored nonprofit activity to place well-qualified, trained women in households where they are needed because of illness or disability or other family emergency. Its primary objective is to preserve and strengthen family life, whether it is primarily focused on serving children, the aged, the chronically ill, the physically handicapped, or the emotionally disturbed.

Upon request, the local agency places the worker after evaluation of the home situation. The hours of service may vary according to the family's need, usually 2 to 6 or 8 hours. Full or partial payment for the service is an obligation of the family or the community or welfare agency if the family cannot afford to pay. The homemaker receives $1.25 per hour and transportation costs. Many of the agencies, although partially supported by community funds, are finding it necessary to add a small administration fee for their services.

Homemakers are mature women selected for their personality, dependability, good health, and special interest in helping people. After screening and acceptance by the local committee, they take a standardized 20-hour training course. The course is sponsored and financed by the New Jersey State Department of Health and administered through the extension division of Rutgers, the State University. Those who complete the course satisfactorily receive a certificate. Upon acceptance for service by the agency, the homemakers are required to have a physical examination, carry a health card, and wear a uniform with identifying insignia. The homemaker is periodically supervised on the job. She is required to report on each case and confer frequently with her supervisor. These reports and conferences provide evidence of her competence, of her reaction to illness and family situations and to the work she is performing. She aids the agency in evaluating the needs of the family and the length of service required. Her observations often are helpful to the supervisor and the physician. As an employee of the agency she is covered by workmen's compensation, public liability insurance, and social security.

In our changing society many factors have

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contributed to the urgent necessity of reevaluating and redirecting community supportive services in terms of more adequately meeting present-day needs. This is equally true of community homemaker service, which should periodically be reviewed in relation to the whole new concept of home care and rehabilitation. Many illnesses can often be treated more effectively at home if adequate help is available to maintain the home and relieve the stresses related to long-term illness. The rising incidence of chronic illness concomitant with our increasing lifespan, as well as other trends in our present-day living, has created an increased need for various kinds of help in the home. Today we can no longer look on homemaker service as merely available to meet crises in the home; we see it as a preventive measure and a restorative service.

Community homemaker service helps to prevent a breakdown in the orderly management of the household because of illness or other family emergency and frequently encourages the family to help itself. It may prevent the lack of adequate supervision of children, poor family nutrition, disproportionate burdens on some members of the household which could produce fatigue, worry, anxiety, resentment, and hostility, absence from work of an employed family member with loss of income, and absence from school of older children. Physicians say the service has prevented temporary breakup of the household, unnecessary removal of sick persons from familiar surroundings to institutions, and placement of children with relatives or in foster homes.

From the standpoint of the community, our records show that homemaker service frees hospital beds for the acutely ill, decreases the demand for custodial facilities, and eliminates the cost of avoidable institutional care.

Various kinds of home helps should be used interchangeably for any particular family. There should be a careful appraisal of the individual family members and of the family as a whole in order to determine the type of service most suited to meet its needs. Families are referred to other appropriate agencies when referral is indicated. The homemaker is carefully selected so that she may prove to be the right person for the particular situation. Homemakers assigned to homes with chronically ill patients are prepared with special in-service training. Demonstrations are a part of this training so that she is capable of carrying out delegated personal care measures under nursing or medical supervision and within the policies of the agencies.

A conference at Arden House held February 14–16, 1960, under the sponsorship of the National Health Council, was held for the purpose of preparing a statement on personal care services as related to community homemaker services and the necessary standards, training, and supervision required.

The need for health emphasis in homemaker training was highlighted by a Public Health Service study which revealed that 93 percent of the families receiving homemaker services during a specified period of time in 1958 had one or more ill members or needed a homemaker because of the absence of a member of the family who was hospitalized.

In 1950 a homemaker service specifically designed to meet the needs of long-term patients was started in Essex County, N.J., under the sponsorship of the county medical society. Carefully selected mature women worked part time to perform this service. This pioneering experience in Essex County was very helpful when a statewide program was started 2 years later.

This statewide program in New Jersey came about through the passage of the Prevention of Chronic Illness Act of 1952. The law contained a provision requiring the State department of health "to plan for the provision of adequate visiting nurse and housekeeping aid services by appropriate public or private agencies throughout the State, to the end that the nursing and medical care being furnished to the chronic sick in their own homes shall be improved in every manner possible."

A State consultant committee of women volunteers representing many skills was appointed by the commissioner of health to work with the newly created division of chronic illness control to promote the development of homemaker service throughout the State. A manual of procedure for establishing a homemaker service was developed, a course of study for homemakers was prepared, and a grant-in-aid was

given to Rutgers to implement the course on the local level. Suggested standards for operation of a homemaker service, educational pamphlets, a filmstrip, and a movie, "Home Again," were then prepared. State and local conferences were held to inform the public about the service.

Members of the consultant committee, which include directors of homemaker services and representatives of official agencies, meet with representatives of local organizations to assist them in starting a service and arranging for the training course. In each instance the homemaker service is encouraged to tailor its program to fit local needs. In the early days, the community homemaker service was operated entirely by volunteers, but the demand for service soon became too great for volunteer effort alone. To demonstrate the importance of adequate continuing supervision of the homemaker and to assist the agency in providing well-qualified directors, the division has made some temporary grants to agencies. However, the rapidly increasing demand for this service and the emerging new look for community homemaker service has necessitated not only one full-time director, but in the larger services, an assistant director. In most instances, the directors have a social work or public health nursing background. We are now developing a training course for directors. We are becoming increasingly aware of the need to make this service available on a 24-hour, 7-day-a-week basis. We understand that a homemaker service in Fort Lauderdale, Fla., has some homemakers willing to give 24-hour service. New Jersey currently has 16 services in 14 of 21 counties. More than 400,000 hours of service were given last year by 11 services in an area covering two-thirds of the State.

In summary, experience in New Jersey and elsewhere shows homemaker service to be a valuable adjunct to medical and nursing service for the homebound patient. It has the dual advantage of releasing hospital beds for the acutely ill and reducing the cost of patient care by using the facilities of the patient's own home. It boosts the morale of both patient and family through the simple expedient of maintaining a well-organized household. As a by-product of the service, it has been noted that often in becoming "useful" again, the homemaker takes a new lease on life.

The homemaker is a helping person trained to give a special kind of service which contributes importantly to the total effort of meeting family needs. She complements rather than substitutes for or competes with a community visiting nurse or practical nurse.

If the best resources a community has to offer in womanpower, financial aid, and citizen and group interest are all coordinated in the establishment and promotion of a homemaker service, its success is assured.

Trends in Home Care

FRANZ GOLDMANN, M.D.

If the best prophet of the future is the past, as Byron once said, then certain predictions about the growth of home care in the next 5 or 10 years appear justified by the trends that have become manifest.

In the years to come, increasing attention will be given to the development of organized programs of home care as distinguished from provision for payment for house calls by physicians and nurses. Ideally, organized programs of home care cover all the services needed by homebound patients regardless of their condition or disease, encourage teamwork of the various types of professional and auxiliary personnel, and foster high quality of service. The prerequisites for the attainment of these objectives are a service organization promoting high quality of service, a payment organization providing for the support of all essential services, and an administrative organization assuring high quality, efficiency, and economy of service.

At present, practically all the organized programs of home care limit eligibility to persons with very low incomes and the indigent. In the future they are likely to be made available to substantial numbers of self-supporting people, regardless of income, through extension of Blue Cross benefits and further growth of

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group-practice prepayment plans. This means a gradual shift in the major source of support for home care programs from public assistance to insurance.

With increases in the number of insured persons eligible for home care services, short-term care as well as long-term care in the patient's own home will be made easier. This will be a significant departure from the present policy of using home care programs mainly, if not exclusively, for the care of chronically ill and disabled people.

There is good reason to assume that elderly people will continue to make up a large proportion of the persons served by organized home care programs in view of the high prevalence of physical impairment among this age group. It is important to keep in mind that many of the patients on home care will receive continued service over long periods, exceeding 2 years in many instances.

The lessons learned from the operation of home care programs in the past may be summarized as follows. First, properly organized and supervised home care is advantageous to the sick because it permits service in the usual environment, assures continuity of care upon discharge from the hospital, and reduces their total medical bills, all matters of particular importance to senior citizens. Second, properly organized and supervised home care contributes to the best possible utilization of expensive hospital beds by facilitating early discharge and preventing unnecessary admission. It reduces capital expenditures for new hospital beds. It does not lower the operating costs of hospitals, as decrease in the average length of stay of patients spells increase in the average daily hospital costs.

Third, organized home care programs are an additional resource, not a cheap substitute for costly hospital care. They are essential to attainment of both progressive patient care and comprehensive medical care. Fourth, home care should be provided only if the clinical condition of the patient makes such service necessary and feasible, the physical environment is suitable, and the psychological attitudes of both patient and family are favorable. Close working relationships of the programs with hospitals are essential to effective service.

Continued observation of a sample of patients on home care over half a year has produced much new material on the characteristics and experience of such patients. It has supplied ample evidence of the value of organized home care to the patients and especially of the preventive aspects of continuous care by teams of physicians, nurses, social workers, physiotherapists, and others. It also reveals that readmissions to hospitals are frequent. A detailed report on this study appears in the January 1960 issue of the *Journal of Chronic Diseases*.

There are many questions concerning home care that require careful consideration. Only a few can be mentioned here.

1. Is it not time to revise the idea that aftercare of patients discharged from the hospital is the primary function of home care programs? Would it not be wise to use such programs also to reduce the need for hospitalization?

2. What is the best method of organizing the services of physicians under organized programs of home care? Would it not be possible to assure high standards and at the same time save physicians' time by organizing home care programs on the basis of districts in the community and link these programs closely to hospitals in the respective districts?

3. Why are homemaker services covered so infrequently? Is it lack of available personnel or of proper supervision of homemaker services? Long experience with visiting homemaker service in some western European countries indicates that the task is by no means insuperable.

4. How is the general public likely to react to the proposition of home care after it has been thoroughly indoctrinated with the idea that the hospital is the center of good professional services?

5. Is it reasonable to assume that an industrial society and an apartment civilization allow children to keep in their households disabled parents requiring more than occasional assistance and care?

Sanitary Engineering Degrees Awarded in 1959

Institution	Doctor's	Master's	Bachelor's
Alabama Polytechnic Institute	------	2	[1]
Alabama, University of	------	0	0
Arkansas, University of	------	0	------
Arizona, University of [2]	0	0	1
Brooklyn, Polytechnic Institute of	------	0	------
California Institute of Technology	0	0	2
California, University of	[3] 2	[3] 8	0
Case Institute of Technology	0	[3] 2	------
Cincinnati, University of	------	0	1
Colorado, University of	------	0	0
Connecticut, University of	------	0	------
Cornell University	1	0	0
Florida, University of	0	6	9
Georgia Institute of Technology	0	1	5
Harvard University	1	[3] 11	0
Idaho, University of	------	0	0
Illinois Institute of Technology	0	0	------
Illinois, University of	0	[3] 3	3
Iowa State University	0	[3] 3	0
Iowa, State University of	1	3	11
Johns Hopkins University	2	[3] 8	------
Kansas, University of	------	1	4
Kentucky, University of	------	0	0
Maine, University of	------	1	4
Manhattan College [2]	------	------	16
Marquette University	------	------	12
Maryland, University of	------	[1]	[1]
Massachusetts Institute of Technology	[3] 3	[3] 9	------
Massachusetts, University of	------	0	0
Michigan College of Mining and Technology	------	0	14
Michigan State University	0	1	------
Michigan, University of	0	[3] 23	1
Minnesota, University of	0	[3] 10	0
Mississippi State College	------	0	0
Missouri School of Mines and Metallurgy	------	2	[3] 8
Missouri, University of	------	[3] 4	0
Nebraska, University of	------	0	------
Newark College of Engineering	------	1	9
New Hampshire, University of	------	[1]	------
New Mexico College of Agriculture and Mechanic Arts	------	0	2
New York University	0	2	4
North Carolina State College	0	2	------
North Carolina, University of	0	[3] 7	------
North Dakota, University of	------	0	------
Northeastern University	------	5	0
Northwestern University	0	[3] 7	------
Ohio State University	0	[3] 1	2
Oklahoma State University	0	0	4
Oklahoma, University of	0	[3] 16	0
Oregon State College	0	2	9
Pennsylvania State University	1	2	1
Pittsburgh, University of [2]	1	[3] 8	0
Puerto Rico, University of	------	------	0
Purdue University	0	5	[3] 4
Rensselaer Polytechnic Institute	------	9	4
Rhode Island, University of [2]	------	0	------
Rice Institute	------	[1]	------
Rutgers University	1	2	4
South Dakota State College	------	1	2
Southern California, University of	------	5	------
Southern Methodist University	------	0	------
Stanford University [2]	1	[3] 6	2
Syracuse University	------	[1]	[1]
Tennessee, University of	------	0	------
Texas Agricultural and Mechanical College	0	[3] 1	3
Texas Technological College	------	0	12
Texas, University of	1	[3] 4	0
Tulane University of Louisiana	------	1	0
Utah, University of	0	0	1
Virginia Polytechnic Institute	0	2	6
Washington State University	------	1	0
Washington University	0	3	[3] 21
Washington, University of	0	1	0
West Virginia University	------	0	0
Wisconsin, University of	1	[3] 5	1
Wyoming, University of [2]	------	0	0
Total	16	197	182

[1] Data not available for 1959.
[2] Schools reporting for the first time in recent years.
[3] Includes foreign nationals.

NOTE: Leaders (------) indicate no specialization offered at this level.

Educational activity in sanitary engineering, as measured by the number of degrees awarded, showed a strong upward surge in the academic year ending June 1959 and approached the 1951 peak for the first time. In particular, the number of graduate degrees conferred reached a new high. Data on degrees given during the period July 1958 through June 1959 are presented in the table (see above). Similar data for the period since 1889 appear in the literature (*1–4*) or have been distributed by the Public Health Service. The data for 1958–59 are more complete than in past years in that nearly all schools offering a program in sanitary engineering at any level are represented.

Briefly, there were 213 graduate degrees in sanitary engineering conferred by institutions in the United States during the 1958–59 aca-

Engineering degrees awarded annually, by type of degrees, 1951–59

Year	Number sanitary engineering degrees	Schools awarding sanitary engineering degrees	Schools offering sanitary engineering curriculums	Total number engineering degrees [1]	Number sanitary engineers per 1,000 engineering degrees
	Bachelor's degrees				
1959	182	32	54	38, 134	4. 8
1958	148	33	45	35, 332	4. 2
1957	145	31	43	27, 748	5. 2
1956	208	32	53	23, 547	8. 8
1955	141	32	44	20, 200	7. 0
1954	164	32	40	19, 707	8. 3
1953	216	36	41	21, 642	10. 0
1952	216	36	41	27, 155	8. 0
1951	244	35	39	37, 904	6. 4
	Master's degrees				
1959	197 (52)	43	69	6, 615	29. 6
1958	128 (29)	35	61	5, 788	22. 1
1957	152 (39)	41	64	5, 203	29. 2
1956	124 (31)	33	67	4, 678	26. 5
1955	134 (34)	33	53	4, 444	30. 2
1954	120 (25)	30	56	4, 130	29. 1
1953	102 (20)	25	57	3, 726	27. 4
1952	105 (22)	29	57	4, 132	25. 4
1951	152	26	57	5, 134	29. 6
	Doctor's degrees				
1959	16 (2)	12	37	714	22. 4
1958	16 (4)	12	36	647	24. 7
1957	11 (1)	6	32	596	18. 5
1956	9 (1)	7	27	610	14. 8
1955	11 (2)	4	28	599	18. 4
1954	9	5	26	590	15. 3
1953	5	4	24	592	8. 4
1952	9	5	23	586	15. 4
1951	7	4	25	586	11. 9

[1] See Tolliver, W. E., and Armsby, H. H.: Engineering enrollments and degrees in ECPD-accredited institutions, 1959. Journal of Engineering Education 50: 450–467, Feb. 15, 1960.

NOTE: Figures in parentheses represent nationals of other countries included in larger figure.

demic year. Of these, 197 were master's degrees and 16 were doctor's degrees. This is an increase of 69 over the 144 such degrees reported for the 1957–58 academic year. The entire increase, about 48 percent, was in the master's degree category, as the same number of doctor's degrees were conferred. Five of the schools appearing on the graduate listing this year for the first time reported a curriculum at the master's degree level. Three of these schools conferred 14 master's degrees. The 69 institutions which reported in the master's degree category both this year and last awarded 55 more master's degrees this year.

Awards of bachelor's degrees also rose this year, but the total was smaller than has been

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reported in some previous years. In the 1958–59 academic year, 182 bachelor's degrees were awarded to students who had completed undergraduate programs emphasizing sanitary engineering. This was an increase of 34 degrees over the 148 conferred for the academic year 1957–58. Five schools appear on the undergraduate listing this year for the first time, and 19 bachelor's degrees were awarded by three of them. The 49 schools which reported in the bachelor's degree category both this year and last awarded 15 more degrees this year, an increase of about 10 percent.

A more detailed discussion of each degree category follows. It refers both to the table giving 1959 graduates by school and to the table which shows a comparison of degree statistics for the period 1951–59.

Bachelor's Degrees

Fifty-four schools reported a sanitary engineering option or equivalent electives in their undergraduate curriculums. Of these, 22 conferred no bachelor's degrees in this field for the academic year 1958–59 (see table on p. 1147). The 32 schools awarding degrees conferred a total of 182, of which 4 were awarded to foreign students. As in past years there was fairly heavy concentration in a few schools. Ten schools awarded 121 degrees or nearly 66.5 percent of the total. The level of bachelor's degrees awarded in 1958–59 was the highest in the last 3 years, exceeding the average of 165 for the past 5 years, but falling below the average of 195 for the past 10 years.

It is difficult to judge how accurate these figures are. Sanitary engineering at the undergraduate level has rarely been organized in the form of a separate department. More often sanitary engineering courses comprise an option in the civil engineering curriculum. Because of this, there is no consistent pattern for the reporting of baccalaureate degrees in sanitary engineering. Some institutions offer a concentration of sanitary engineering courses such as might be found in an elective sanitary engineering option of a civil engineering curriculum. Others are reporting students who may have taken several elective courses in sanitary engineering beyond the few such courses required of all registrants in the civil engineering curriculum. A few of the figures may indicate civil engineering students who have taken only the required courses which fall under the general heading of sanitary engineering. In such situations it would be difficult to say that the figures in this report indicate a particular trend in sanitary engineering manpower. The reporting of them, however, provides continuity in the record of this information and at least a rough measure of the direction of activity in sanitary engineering at the undergraduate level.

Master's Degrees

Of the 69 schools reporting a curriculum in sanitary engineering at the master's level, 26 did not confer any master's degrees in the field of sanitary engineering. The 43 schools which did confer degrees awarded a total of 197, of which 52 were awarded to foreign students. A large proportion of the master's degrees were conferred by a fairly small group of the schools. Nine schools awarded 102 degrees, or about 51.8 percent of the total. The total of 197 degrees was the highest ever recorded for the sanitary engineering field at the master's degree level, and indicates a sharp rise over the prevailing level of past years. Some of the increase reflects the inclusion in the compilation for 1958–59 of more schools than were represented in past surveys. For the 10-year period 1950–59, the average number of master's degrees awarded in sanitary engineering was 136. Over the past 5 years this average was about 147 degrees.

There is an increasing trend to consider the master's degree to be the qualifying level of training for work in the sanitary engineering field. This was brought out in the "Conference Report of the 1957 Conference on Education, Training and Utilization of Sanitary Engineers," and adds significance to the substantial increase in the number of master's degrees awarded in the academic year 1958–59. The total of 197 degrees is so far above the relatively stable level of recent years that there is reluctance to use this as a firm base for predictions on the future of sanitary engineering training at this level. It is interesting to note the increase in both the number of schools offering the sanitary engineering curriculum and those award-

ing degrees during the 1958–59 academic year. This situation indicates that interest in the field is being sustained and perhaps heightened.

A major problem in such an evaluation has been those schools which offer a master's program in sanitary engineering but have not had students completing this program. Twenty-six schools which reported no degree awards during 1958–59 have conferred a total of only 57 master's degrees since 1950, an average of slightly more than 2 degrees per school over the entire 10-year period. The percentage of schools actually granting master's degrees has been on an upward trend, however, indicating an increased interest on the part of both schools and students.

Doctor's Degrees

There were 37 schools reporting a program in sanitary engineering leading to the doctor's degree. Of these, 25 granted no degrees during the 1958–59 academic year. The remaining 12 schools reporting degree awards conferred a total of 16, of which 2 went to foreign students. As might be expected, all of the schools having a doctoral program also have a master's program. In the last 10 years a total of 97 doctor's degrees have been awarded to students specializing in sanitary engineering. Over that same period of time, the 12 schools which reported degree awards for 1958–59 accounted for 81, about 83 percent of the total. Again, this indicates the concentration of activity in the field of sanitary engineering training. The number of doctor's degrees awarded in 1958–59 was the same as for 1957–58, remaining at a high level compared with earlier years. The average number of doctor's degrees awarded per year over the 10-year period 1950–59 was 9.7. The 5-year average now stands at 12.6 degrees.

Since the past 5 years have seen a relatively high level of doctor's degree awards, and since there appears to be an increase in the number of master's degrees conferred, it would seem likely that the number of doctor's degrees will continue as high as or higher than it has been in the past several years. It should be noted that the concentration of degree-awarding institutions is greater at the doctoral level than at either the bachelor's or master's level. While this situation indicates a present lack of students, the schools which now have no doctoral students represent a future potential source of teaching and research personnel. This could be particularly significant if activity at the bachelor's and master's levels is to increase, for if more students are enrolled at these lower levels, there will be a greater demand for teaching and research personnel. There is an increasing demand that such personnel hold the doctorate.

Current Graduate Enrollment

For the first time since this survey was started, figures have been collected which indicate the current enrollment of students in sanitary engineering programs leading to master's and doctor's degrees.

The figures for the 1959–60 academic year are gross figures showing simply those students enrolled in any form of graduate program in sanitary engineering. There is no breakdown as to length of program and no breakdown as to the concentration of study. In other words, the figures do not indicate how many students are studying full time, how many are studying half time while teaching or doing research, or how many students are enrolled in evening study programs.

Nevertheless, these enrollment figures are the beginning of what will become a regular part of this annual report. They will be so collected in the future that the groups noted above can be broken out and analyzed. It is hoped that such figures will form the basis for yearly predictions of graduate degree awards. During the coming year, schools offering sanitary engineering graduate programs will be contacted in an effort to obtain enrollment figures for the past several years. Such a statistical history will more quickly provide a basis for analyses of training capacity.

For the 1959–60 academic year, there are 413 students enrolled in master's degree programs and 118 enrolled in doctoral programs. The master's degree students are enrolled in a total of 58 schools, while the doctoral candidates are studying in 33 schools. These latter figures show the high percentage of engineering schools

now actively engaged in graduate programs. While 43, or about 62 percent of the schools offering master's programs, granted degrees in 1958–59, there are students enrolled in 58, or about 84 percent of these schools, in the 1959–60 academic year. This indicates heightened activity and means that there will be less concentration of students than in the past several years. The same is true of the doctoral candidates. While only 12, or about 32 percent of schools offering doctoral programs, granted degrees in 1958–59, there are students enrolled in 33, or more than 89 percent of these schools, in the 1959–60 academic year.

With information on only 1 year, it would not be wise to make any predictions or to cite any trends in activity or future degree awards. However, the high level of enrollment in the various schools certainly indicates a healthy situation and an increased interest in the field of sanitary engineering study and instruction.

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SEC Technical Reports

A limited number of the following reports are available from the Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio. Order by number.

Air Monitoring and Sampling Networks. Proceedings of the 1959 seminar. Technical Report A60–3. 1960; 135 pages.

Air Pollution From Alfalfa Dehydrating Mills. Technical Report A60–4. 1960; 25 pages.

Air-Borne Particulate Emissions From Cotton Ginning Operations. Technical Report A60–5. 1960; 20 pages.

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Address inquiries to the publisher or sponsoring agency.

Estimated Morbidity in the United States Based on Monthly Labor Force Report

PHILIP E. ENTERLINE, Ph.D., and WILLIAM H. STEWART, M.D.

SINCE 1943 the U.S. Bureau of the Census has been conducting monthly interviews of a representative sample of the noninstitutionalized civilian population of the United States. The primary purpose of these interviews is to obtain estimates of the total labor force, employment, unemployment, and number of workers outside the labor force.

Starting in July 1947 estimates have been published monthly of the number of employed persons 14 years of age and over who did not work at all the week preceding an interview because they were ill (*1, 2*). This is the longest continuous series of estimates on illness available for the United States. The magnitude of the sample interviewed permits rather detailed comparisons of reported illness with social and demographic data. From July 1947 until May 1956, a total of about 21,000 households were interviewed each month. Starting in May 1956 the number was increased to 35,000 households. It is the purpose of this paper to evaluate these data.

In judging data relating to illness it is important to keep in mind the distinction between illness as a concept and the manner in which this concept is measured. A concept is simply an idea of what a thing in general should be. Any particular measure of a concept is most useful if it is known how the measure was derived and if these methods satisfy the requirements of the user. Illness data from the labor force survey represent responses to questions which are presented in the technical note at the end of the paper. These responses were obtained under conditions specified there and more fully in publications relating to the labor force survey (*1–3*).

It is not always easy to judge the usefulness of data by examining a necessarily limited description of the procedures by which the data were derived. It is not known, for example, how closely interviewers for the labor force survey followed the instructions provided to them, or to what extent respondent replies reflect situations as they actually existed. Some help in evaluation is provided if it is known whether data vary apparently in response to the same stimuli as other data designed to measure illness. This report will be devoted mainly to comparisons of illness data from the labor force survey with other data about illness in the United States.

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Illness Trends

Figure 1 shows the percentage of the total noninstitutionalized employed civilian labor force found on each monthly survey not to have worked at all the week preceding the interview because of illness. Also shown is a 12-month moving average. The monthly percentage reported not working because of illness generally ranged between 1 and 2 percent during the period July 1947 through September 1959, with rates in excess of 2 percent occurring only in February 1953, and October and November 1957. The 12-month moving average shows no overall trend, although the general level of illness appears to have been somewhat lower during the period 1949 through 1954 than in other years.

A series on illness with which these data can be compared relates to the Armed Forces. This series shows the average daily proportion of total manpower unavailable for duty during each month because of illness (*4–6* and personal communications from Dr. Wilbur V. Charter, Bureau of Medicine and Surgery, U.S. Navy, and Eugene Hamilton, Medical Statistics Division, U.S. Army). In the table and in figure 2, these data are compared with data derived from the labor force survey for the employed civilian labor force. Monthly data are available for the Air Force and the Navy only since July 1949.

Prior to 1955 the prevalence of illness in the Armed Forces, particularly in the Army, was relatively high, possibly reflecting some effect of the Korean conflict. The high prevalence of illness in the Army during 1947 and 1948 was apparently an aftermath of World War II.

Starting in 1955, the trends and fluctuations in rates are similar for all four series of data. Also starting in 1955, the general level of illness for the Armed Forces was similar to the level of illness in the civilian labor force series. Since the latter refers to illnesses mainly of a week's duration or longer, a somewhat lower rate might be anticipated. One reason for similar levels of illness may be that the civilian working population is older than the military, and illness tends to be positively associated with age; hence the age difference may partly offset the effects of the longer periods of illness to which the labor force data are limited.

Seasonal Variation

Figures 1 and 2 show very definite seasonal variations in the prevalence rate for illness in the employed civilian labor force. These seasonal variations tally quite well with those appearing in data for the Armed Forces, as is shown on figure 2, with a peak appearing in February and with relatively low rates for June, July, and August. They also tally well with other data available for civilian populations. In a study of illness in Baltimore for the years 1938–43, with visits at regular monthly intervals by interviewers experienced in morbidity surveys, the prevalence rate for persons disabled by illness on the day of the visit was found to be highest in February and lowest during the summer months (*7*).

Starting in May 1955, data have been collected each month in the labor force survey on persons 14 years of age and over working part-time (less than 35 hours) the week preceding the interview because of illness. (Since July 1959, these data have been published monthly by the Department of Labor in *Employment and Earnings*, table A–16). The addition of these data to estimates of the number of employed persons 14 years of age and over who did not work at all the week preceding the interview because they were ill provides an estimate of all illness causing work loss in the civilian labor force.

Figure 3 shows the percentage of the employed civilian population absent on an average day because of illness during each quarter in the period July 1955 through September 1959. Starting with the third quarter of 1957, estimates derived from the labor force survey are compared with estimates from the National Health Survey (*8* and unpublished data). Seasonal variations are quite similar in these two series. Starting in the summer of 1958, the prevalence of illness is also quite similar.

It is not certain why estimates from the labor force survey are appreciably lower than those from the National Health Survey during the fall of 1957 and the spring of 1958. The National Health Survey was a new activity in 1957, and it is possible that its newness was somehow associated with these higher reported rates of illness. There are many methodological differences between the two surveys which could be responsible for differing results. The purpose of the comparison in figure 3 was mainly to see if seasonal variations in illness reported in the labor force survey are generally consistent with those observed in a study of the civilian population of the United States designed more specifically to measure illness.

Deviations From Expected Rates

Figure 4 shows for the labor force survey the difference between the observed monthly prevalence of employed persons reported not working at all the week preceding the interview because of illness, and an expected monthly

Figure 1. Prevalence of illness in the employed civilian labor force resulting in work loss of a week or more, by month, July 1947–September 1959

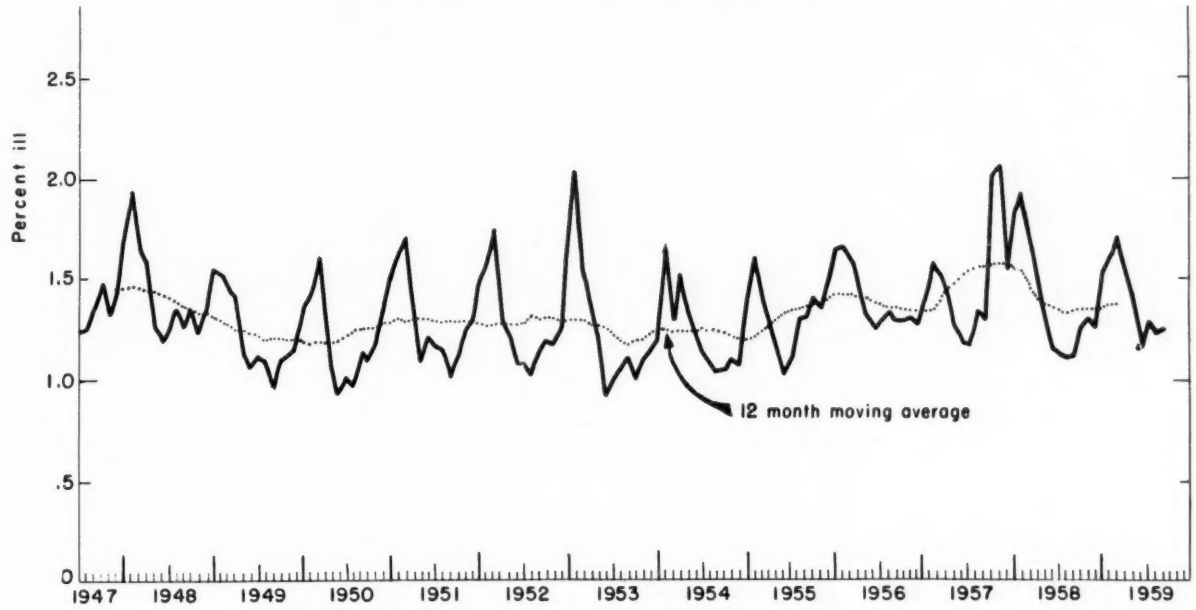
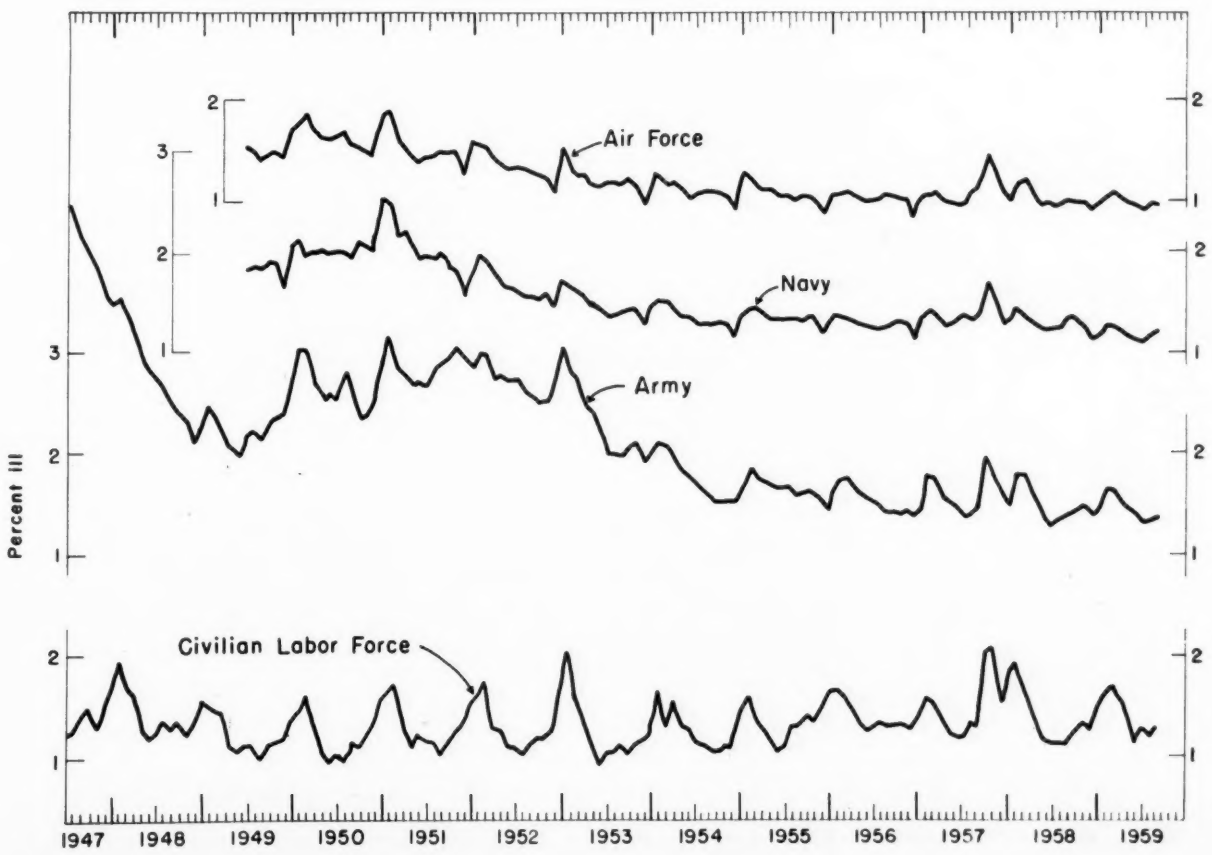


Figure 2. Prevalence of illness in the Armed Forces resulting in excuse from duty of a day or more, and in the employed civilian labor force resulting in work loss of a week or more, by month, July 1947–September 1959



Prevalence of illness in the employed civilian labor force resulting in work loss of a week or more, and in the Armed Forces resulting in excuse from duty of a day or more, by month, July 1947–September 1959

Month and year	Employed civilian labor force (percent)	Armed Forces			Month and year	Employed civilian labor force (percent)	Armed Forces		
		Air Force (percent)	Navy (percent)	Army (percent)			Air Force (percent)	Navy (percent)	Army (percent)
1947					*1950*				
July	1. 23	(1)	(1)	4. 52	August	. 97	1. 69	2. 00	2. 80
August	1. 26	(1)	(1)	4. 30	September	1. 14	1. 57	1. 95	2. 63
September	1. 36	(1)	(1)	4. 08	October	1. 09	1. 51	2. 11	2. 37
October	1. 49	(1)	(1)	3. 97	November	1. 18	1. 50	2. 06	2. 39
November	1. 32	(1)	(1)	3. 81	December	1. 34	1. 44	2. 01	2. 54
December	1. 43	(1)	(1)	3. 57					
1948					*1951*				
January	1 70	(1)	(1)	3. 50	January	1. 55	1. 83	2. 54	2. 88
February	1. 94	(1)	(1)	3. 54	February	1. 63	1. 90	2. 48	3. 18
March	1. 68	(1)	(1)	3. 38	March	1. 71	1. 60	2. 19	2. 89
April	1. 58	(1)	(1)	3. 14	April	1. 30	1. 53	2. 21	2. 79
May	1. 26	(1)	(1)	2. 93	May	1. 08	1. 45	2. 09	2. 67
June	1. 18	(1)	(1)	2. 83	June	1. 21	1. 38	1. 93	2. 71
July	1. 24	(1)	(1)	2. 75	July	1. 17	1. 45	1. 97	2. 68
August	1. 35	(1)	(1)	2. 63	August	1. 15	1. 46	1. 94	2. 86
September	1. 28	(1)	(1)	2. 47	September	1. 01	1. 52	1. 99	2. 93
October	1. 35	(1)	(1)	2. 38	October	1. 12	1. 49	1. 85	2. 97
November	1. 22	(1)	(1)	2. 32	November	1. 23	1. 49	1. 81	3. 05
December	1. 32	(1)	(1)	2. 13	December	1. 28	1. 25	1. 56	2. 99
1949					*1952*				
January	1. 55	(1)	(1)	2. 25	January	1. 49	1. 59	1. 78	2. 88
February	1. 53	(1)	(1)	2. 44	February	1. 58	1. 58	1. 99	3. 03
March	1. 46	(1)	(1)	2. 35	March	1. 74	1. 53	1. 90	2. 99
April	1. 42	(1)	(1)	2. 11	April	1. 30	1. 43	1. 77	2. 78
May	1. 12	(1)	(1)	2. 03	May	1. 23	1. 39	1. 68	2. 77
June	1. 06	(1)	(1)	1. 97	June	1. 09	1. 36	1. 66	2. 74
July	1. 11	1. 52	1. 82	2. 15	July	1. 08	1. 35	1. 62	2. 74
August	1. 10	1. 50	1. 86	2. 22	August	1. 02	1. 32	1. 57	2. 65
September	. 96	1. 41	1. 82	2. 16	September	1. 12	1. 30	1. 56	2. 59
October	1. 11	1. 49	1. 91	2. 27	October	1. 17	1. 28	1. 53	2. 54
November	1. 13	1. 50	1. 90	2. 34	November	1. 15	1. 23	1. 59	2. 54
December	1. 15	1. 46	1. 63	2. 36	December	1. 26	1. 12	1. 45	2. 67
1950					*1953*				
January	1. 35	1. 73	2. 05	2. 65	January	1. 67	1. 54	1. 73	3. 05
February	1. 41	1. 84	2. 14	3. 02	February	2. 04	1. 34	1. 66	2. 84
March	1. 61	1. 86	1. 96	3. 01	March	1. 51	1. 28	1. 61	2. 78
April	1. 35	1. 70	1. 99	2. 72	April	1. 38	1. 26	1. 54	2. 52
May	1. 05	1. 63	2. 02	2. 55	May	1. 20	1. 19	1. 47	2. 45
June	. 93	1. 63	1. 98	2. 56	June	. 91	1. 17	1. 42	2. 27
July	1. 00	1. 67	2. 02	2. 52	July	1. 01	1. 18	1. 39	2. 07
					August	1. 04	1. 18	1. 38	2. 04

[1] Information not available.

SOURCE: References 1, 2, 4–6.

prevalence. The expected rate was derived by computing the mean monthly prevalence rates for the 12-year period July 1947–June 1959 as percentages of the grand prevalence rate for all months and all years, and applying these percentages to the mean rate for each year. The difference between the observed and the expected monthly prevalence rates might be considered the "excess monthly prevalence rate," that is, the part of the rate not explainable by seasonal expectancies and trends in rates.

The effects of four previously noted influenza epidemics are apparently reflected in the labor force data: epidemics in March of 1950

Prevalence of illness in the employed civilian labor force resulting in work loss of a week or more, and in the Armed Forces resulting in excuse from duty of a day or more, by month, July 1947–September 1959—Continued

Month and year	Employed civilian labor force (percent)	Armed Forces		
		Air Force (percent)	Navy (percent)	Army (percent)
1953				
September	1.11	1.16	1.42	2.01
October	1.01	1.22	1.43	2.09
November	1.11	1.14	1.44	2.11
December	1.15	.98	1.26	1.94
1954				
January	1.20	1.27	1.44	2.05
February	1.66	1.23	1.53	2.11
March	1.30	1.18	1.50	2.07
April	1.53	1.19	1.42	1.98
May	1.32	1.14	1.33	1.84
June	1.26	1.02	1.31	1.75
July	1.14	1.06	1.27	1.69
August	1.08	1.09	1.28	1.64
September	1.04	1.09	1.27	1.54
October	1.05	1.08	1.30	1.51
November	1.09	1.03	1.29	1.51
December	1.08	.92	1.13	1.51
1955				
January	1.43	1.30	1.34	1.66
February	1.61	1.22	1.43	1.88
March	1.42	1.17	1.43	1.77
April	1.27	1.12	1.39	1.72
May	1.17	1.12	1.35	1.69
June	1.03	1.04	1.35	1.67
July	1.09	1.04	1.35	1.67
August	1.30	1.01	1.34	1.60
September	1.30	1.03	1.33	1.62
October	1.40	1.04	1.36	1.61
November	1.36	1.01	1.36	1.59
December	1.49	.85	1.21	1.46
1956				
January	1.64	1.07	1.29	1.54
February	1.65	1.07	1.37	1.74
March	1.57	1.09	1.34	1.79
April	1.43	1.06	1.32	1.69
May	1.32	.98	1.28	1.65
June	1.25	.99	1.25	1.54
July	1.28	1.00	1.24	1.50
August	1.33	1.02	1.24	1.43
September	1.30	1.04	1.25	1.41
October	1.31	1.02	1.28	1.40
November	1.31	1.02	1.28	1.44
December	1.29	.84	1.15	1.38
1957				
January	1.40	.96	1.28	1.43
February	1.58	1.05	1.40	1.77
March	1.53	1.06	1.37	1.75
April	1.39	1.03	1.29	1.61
May	1.24	.98	1.25	1.50
June	1.18	.97	1.31	1.43
July	1.18	.96	1.37	1.37
August	1.33	1.08	1.32	1.40
September	1.30	1.11	1.38	1.54
October	2.03	1.44	1.70	1.96
November	2.06	1.29	1.49	1.74
December	1.54	1.09	1.29	1.57
1958				
January	1.84	.98	1.31	1.50
February	1.94	1.17	1.43	1.79
March	1.65	1.20	1.37	1.78
April	1.49	1.07	1.31	1.59
May	1.31	.99	1.26	1.44
June	1.16	.96	1.24	1.31
July	1.14	.94	1.25	1.29
August	1.13	.96	1.25	1.35
September	1.14	.98	1.28	1.41
October	1.26	.98	1.28	1.46
November	1.31	.98	1.26	1.47
December	1.25	.90	1.13	1.40
1959				
January	1.52	.97	1.16	1.48
February	1.61	1.04	1.27	1.66
March	1.70	1.06	1.26	1.65
April	1.57	1.04	1.22	1.54
May	1.39	.96	1.17	1.46
June	1.15	.94	1.13	1.40
July	1.30	.92	1.12	1.31
August	1.23	.96	1.17	1.34
September	1.27	.95	1.19	1.35

and 1951 and in February of 1953 (*9*), and the Asian influenza epidemic in October and November of 1957 (*10*). Some of the periods of excess prevalence of illness shown in figure 4 are apparently not associated with influenza epidemics. On the other hand, an epidemic in the spring of 1958, reported by Dauer (*10*), does not appear in figure 4. The failure of the 1958 epidemic to appear in the chart is due largely to the inclusion of epidemic rates in the data from which expected rates were computed.

A refinement of the data shown in figure 4 is shown in figure 5. Here, the effects of the epidemics have been removed from the expected rates by substituting rates observed in the same month for the preceding nonepidemic year. For March 1950 and March 1951 the rate observed for March 1949 was substituted; for

February 1953 the rate observed for February 1952 was substituted; and for October 1957 through March 1958 the rates observed for October 1956 through March 1957 were substituted. In addition, for figure 5 the adjustment for trend was made quarterly rather than annually as in figure 4. This removes some cyclical movement apparently due to trends in the overall illness level. The method used in computing a normal seasonal curve for illness was essentially the one used by Collins and Lehmann in computing a normal seasonal curve for deaths from influenza and pneumonia (*9*). The base period for the illness data is the entire 12 years for which data were available.

Weekly excess mortality from influenza and pneumonia is also shown in figure 5. Data previously reported for the period July 1947 through June 1956 (*9*) have been carried through June 1959. The base period for July 1956 through June 1959 is the 5 years ending in August 1955.

The epidemic of Asian influenza in the spring of 1958 shows clearly in the labor force data plotted in figure 5, corresponding to an excess in mortality from influenza and pneumonia noted during that period. Generally, influenza epidemics, as measured by excess mortality from influenza and pneumonia, are reflected quite well in labor force illness data. There are, however, some periods of excess prevalence of illness which may be due to influenza but which are not associated with excess mortality. Both mortality and illness data suggest that the effects of influenza have increased since 1947.

Starting in 1954, the pattern of fluctuations in the prevalence of illness in the labor force survey series shown in figures 4 and 5 differs somewhat from the pattern for prior years,

Figure 3. Percent of employed civilian labor force absent on an average workday because of illness as estimated from labor force survey data, and National Health Survey data, by quarter, July 1955–September 1959

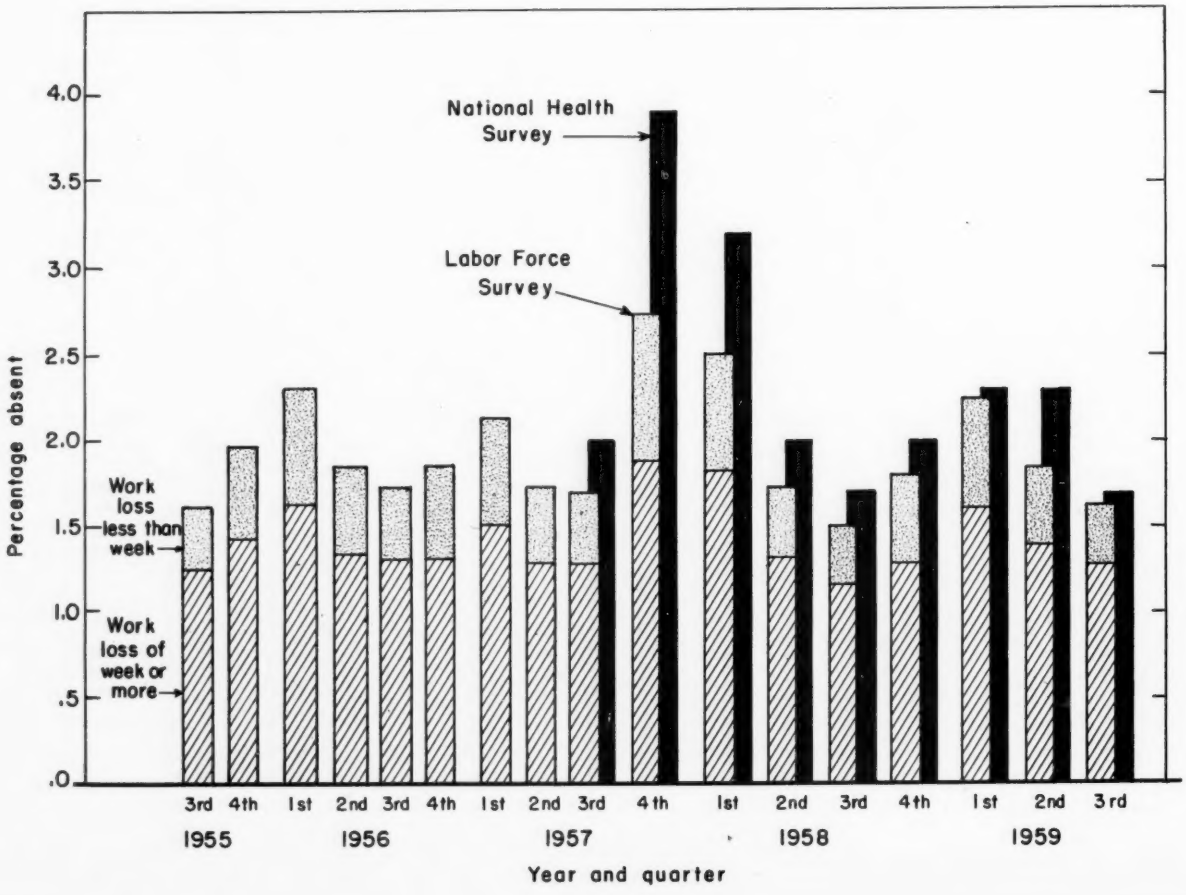


Figure 4. Monthly excess prevalence of illness in the employed civilian labor force resulting in work loss of a week or more, July 1947–June 1959

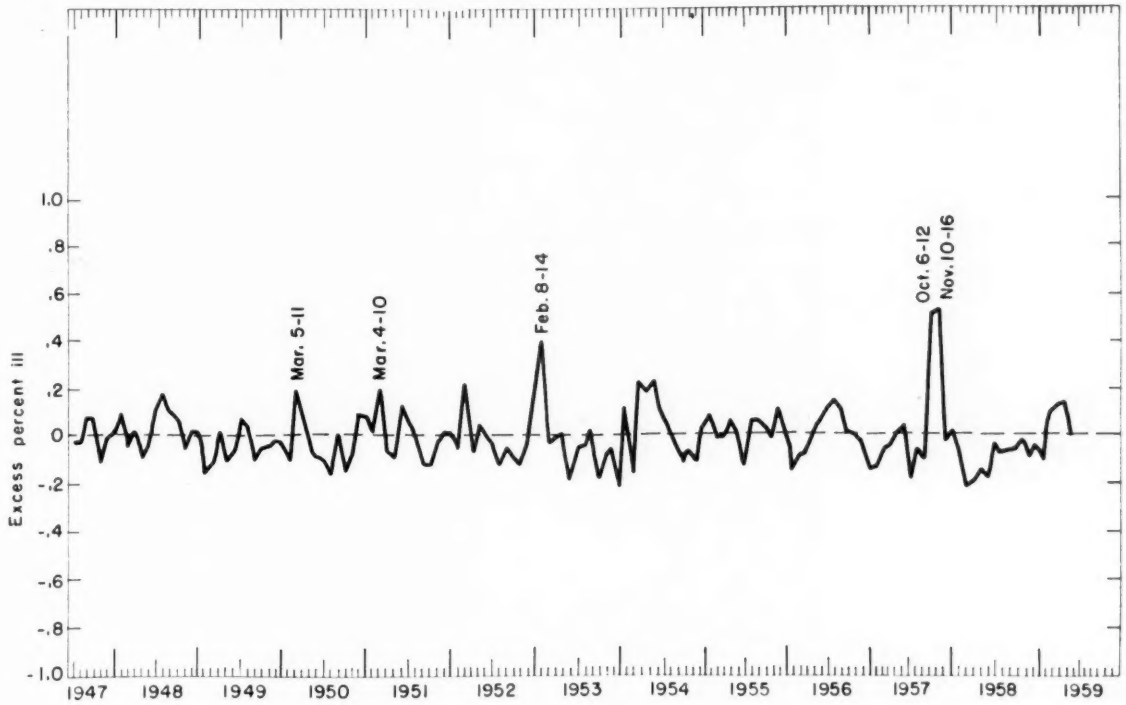
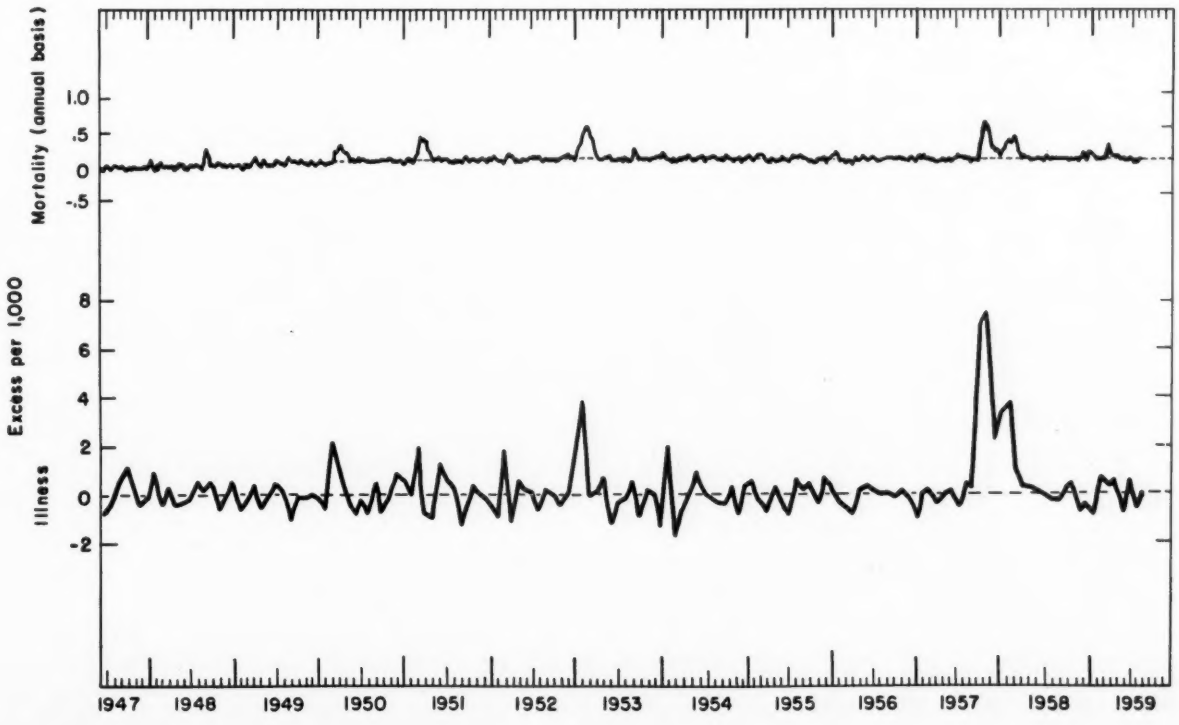


Figure 5. Monthly excess prevalence of illness in the employed civilian labor force resulting in work loss of a week or more (with influenza epidemics removed from expected rates), and weekly excess mortality from influenza and pneumonia in groups of cities in the United States



tending to move more systematically from one month to the next. This may be due to an expansion of the labor force sample from a 68-area sample to a 230-area sample in February 1954. Although the number of households interviewed each month did not change, the increase in the numbers of areas sampled, coupled with a substantially improved estimation procedure, increased the reliability of most of the major statistics by an amount equivalent to doubling the sample size (*3*).

Conclusion

For many purposes, the framework within which the presence of illness is established in the labor force survey would seem favorable to a fairly meaningful interpretation. For the series starting in July 1947, the type of illness dealt with is probably moderately severe, requiring the loss of a full week's work, or more, for persons otherwise economically active. It is not so severe, however, as to prevent employment. It is illness defined in a particular and possibly peculiar way.

The illness measured by the labor force survey apparently responds to many of the same factors as other measures of illness. Probably chief among these is influenza. In view of the large amount of data routinely accumulated by the monthly survey of the labor force and the general acceptance of its definitions of common occupational and economic variables, further examination of tabulated as well as untabulated materials would seem to be a valuable adjunct to other currently available measures of illness in the United States.

Summary

Starting in July 1947, estimates have been published in "The Monthly Report on the Labor Force" showing the total employed persons in the civilian labor force 14 years of age and over, and the number of these persons who did not work at all the week preceding a monthly interview because they were ill.

During the period July 1947 through September 1959, the percentages of ill persons ranged between 1 and 2 percent. No overall trends are apparent.

Fluctuations in these illness rates generally conform to fluctuations observed in illness rates for the Armed Forces; seasonal variations conform to those observed in illness surveys of civilian populations and to seasonal variations in Armed Forces data.

Influenza epidemics noted in studies of mortality are clearly shown in the labor force series.

Generally, information on illness reported in "The Monthly Report on the Labor Force" would seem to be a valuable supplement to other data regarding illness patterns and trends in the United States.

TECHNICAL NOTE

Definitions

Employed civilian labor force. "The Monthly Report on the Labor Force" includes in the employed civilian labor force all civilians who, during a specified week: (*a*) did any work at all as paid employees or in their own businesses or professions, or on their own farms, or worked 15 hours or more as unpaid workers on a farm or in a business operated by a member of their families; or (*b*) were not working or looking for work but had jobs or businesses from which they were temporarily absent because of illness, bad weather, vacation, or labor-management dispute, or because they were taking time off for various other reasons.

The National Health Survey identifies the civilian population "usually working." This population, while similar, is not identical to the employed civilian labor force as defined in "The Monthly Report on the Labor Force."

Illness. As used here, and as the concept of illness applies to the working population, illness data are intended to include all persons not working because of medical reasons, including sickness, injuries, or ill effects from earlier accidents or injuries. This concept is implied in data published in "The Monthly Report on the Labor Force" and specified in data published for the Armed Forces and by the National Health Survey.

Measurement of Illness

Labor force survey. Illness lasting an entire workweek is identified for each person 14 years of age and over from the following series of questions:

"Did _____ do any work at all last week, not counting work around the house?" If "No":

"Was _____ looking for work?" If "No":

"Even though _____ did not work last week, does he have a job or business?" If "Yes":

"Why was he absent from work last week?"

Answers to the last question fall mainly into four categories: own illness, on vacation, bad weather, and

labor dispute. The illness prevalence rate for a single month is the proportion of the enumerated employed civilian labor force who reported that they did no work during the entire week preceding the enumeration because of own illness.

Illness lasting less than a workweek is identified for each employed person 14 years of age and over who worked less than 35 hours the week prior to the interview, from the following series of questions:

"Does _____ usually work 35 hours or more a week at this job?" If "Yes":

"What is the reason _____ worked less than 35 hours last week?"

One category of response to the last question is "own illness." In order to derive the prevalence rates shown in figure 3, it was necessary to estimate the average number of days of absence for persons absent less than 1 workweek. This was estimated at 2.54 days, based on a study by Gafafer and Frasier (*11*). Workdays were estimated as 260 per person per year.

Each month's illness figures represent a single week's experience for the employed civilian labor force. Prior to July 1955, published figures were for the calendar week containing the eighth day of the month. In July 1955, this was changed to the calendar week containing the 12th day of the month.

Armed Forces. In the Armed Forces, illness is identified from reports on persons not available for duty for medical reasons. The Air Force includes in the illness category persons under treatment as inpatients, in quarters, on sick leave, or AWOL from a patient status for 10 days or less. The Army includes excused-from-duty patients in hospitals and quarters in all medical-treatment facilities. The illness prevalence rate for a single month is the proportion of the available man-days lost because of illness, that is, the average daily proportion of the average total manpower unavailable for duty because of illness. This prevalence rate is usually referred to as the noneffective rate or ratio and is a principal measure of manpower loss due to medical causes or injury used by the Armed Forces.

Data for the Air Force and Navy are worldwide. Data for the Army are for the continental United States only, but include evacuees. Air Force data are for all medical causes while Navy and Army data exclude battle injuries.

National Health Survey. In the National Health Survey, illness is identified for the "usually working" population 17 years of age and over by first attempting to identify for the 2-week period preceding the interview sickness, accidents or injuries, ill effects from earlier accidents or injuries, and medicine or treatment taken. Also, an attempt is made to identify the presence of "ailments or conditions that have continued for a long time" and a "yes" or "no" response is obtained to a checklist of 35 chronic conditions and impairments. If any illness (disease, impairment, accident, etc.) is identified in any of these screening questions and it is established that the illness caused the individual to cut down on his usual activities for as much as a day, the question is asked: "Last week or the week before, would you have been working at a job or business except for (the condition named)? How many days [during last week or the week before] did (the condition named) keep you from work?"

The illness prevalence rate for any period of time is the proportion of available man workdays lost because of illness. In this report, available man workdays were estimated as 260 per person per year.

Standard Error of Labor Force Estimates

The estimates of the prevalence of illness in the civilian employed labor force are based upon a sample and may differ somewhat from figures which would have been obtained if a complete census had been taken. The following table gives a rough idea of the order of magnitude of the standard error of the estimated prevalence rates shown for each month, beginning in February 1954. The chances are about 68 out of 100 that an estimate for a single month would differ from a complete census by less than the standard error.

Standard error of labor force illness prevalence rates

Percentage ill	Standard error of estimate	
	February 1954–April 1956	May 1956–September 1959
0.5	0.053	0.042
1.0	.074	.059
1.5	.092	.073
2.0	.104	.082
2.5	.114	.091

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Program Notes

The Personal Touch

Enlistment of the cooperation of physicians in many public health programs is frequently difficult. This is not in any sense due to their perversity or lack of interest, but is related more to lack of emphasis on public health teaching when many physicians attended medical school.

The need for physician cooperation became evident in the tuberculosis control program of the Boston Health Department. Here it was a question of alerting physicians in high incidence areas to the frequency of diagnoses of tuberculosis in their areas, and emphasizing the services available to them in the Boston Health Department for the diagnosis, treatment, and followup of cases. The health department had sent letters giving physicians this information, but it was impossible to evaluate their effectiveness. It was thought advisable to extend this educational program.

Personal interviewing of the physicians of Boston to call to their attention the public health aspects of tuberculosis control was the course selected. Greatest emphasis is placed on contacts with physicians who practice in areas where tuberculosis incidence is highest, with efforts in the areas of lesser incidence determined by personnel time available for the program. Two health educators from the department and two from the Boston Tuberculosis Association were made available.

Information concerning tuberculosis control presented to the physicians at pre-arranged visits to their offices include:

• Statistics on the incidence of tuberculosis in Boston in general and in the specific area of practice.

• Schedules giving the times and locations where X-ray, laboratory, and consultation services are available in the health department for private patients, stressing that the results of these examinations are reported only to the referring physician who retains the private care of the patient.

• Literature on the use of the Mantoux tuberculin test, its interpretation, and a detailed description of its technique, with a supply of 1: 2,000 solution of O.T. provided on request.

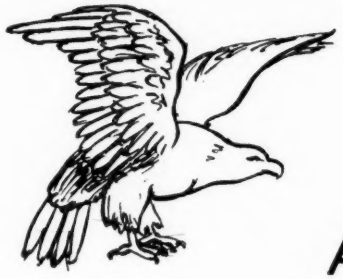
• Detailed information on the rehabilitation services available to private patients.

They are given stickers to attach to prescription blanks authorizing 14″ x 17″ chest X-rays of patients, the findings reportable only to the prescribing physician, and bottles for use in sending specimens of sputum of patients to the department for analysis for tubercle bacilli by smear or culture. They are also informed that sensitivity testing is available upon request.

Questions are answered and physicians are asked for any suggestions or criticisms, either on health department practices in general or the tuberculosis program in particular.

The interviewers have been very well received. Of 111 physicians visited, only 2 were not interested and only 1 showed annoyance. Double postcards for followup of these interviews were returned by 50 percent of the physicians visited. Of the physicians who returned postcards, over 95 percent were enthusiastic and stated that they would like additional visits at intervals of about a year.—GEORGE KAHN, M.D., M.P.H., *chief, bureau of disease control, Boston Health Department.*

United States–Mexico Border Public Health Association



CONFERENCE REPORT

A model international medium for the reciprocal flow of ideas, cooperative planning, and the fusion of energy and resources for greater positive health, the United States-Mexico Border Public Health Association held its 18th annual meeting April 4–8, 1960, at Hermosillo in the State of Sonora, Mexico.

The more than 300 delegates, primarily public health officials from both countries, included a roster of distinguished participants headed by Dr. José Alvarez Amézquita, Mexican Minister of Health and Welfare, the Honorable Robert C. Hill, United States Ambassador to Mexico, Dr. Leroy E. Burney, Surgeon General of the Public Health Service, Don Alvaro Obregón, Governor of Sonora, and Dr. Abraham Horwitz, director of the Pan American Sanitary Bureau, WHO Regional Office for the Americas.

Progress in Malaria Eradication

The opening presentation reviewed the malaria eradication campaign in Mexico, now terminating the total coverage phase of spraying all domiciles. Studies in 1956 following plans begun a year before, delineated as malarious 58 percent of Mexico's geographic area. In each of the subsequent 3 years, more than 3 million domiciles were protected with two treatments of DDT or one of dieldrin by spraying teams brought by truck, horseback, or boat.

By 1959, malaria death rates in Mexico had fallen from 90, the annual average for the disease during 1949–53, to less than 10 per 100,000 population. Reported malaria morbidity has dropped by 98 percent since 1950. For the coming 3 years, the timetable calls for surveillance to eliminate the residual foci of malaria.

A unique feature of the campaign is the appointment of honorary health aides—community leaders who have been effectively helping to broaden health education locally.

Quarantine Activities

In a panel discussion of the quarantine activities of the Public Health Service along the Mexican border, it was pointed out that the process of screening Mexican nationals entering the United States has value for both nations. Some of the cases of communicable diseases found are treatable during the examination period, and others, with the active sup-

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port of Mexican health officials, can be cared for in Mexico.

Nurse Recruitment

The growing need for nurses in the face of a chronic shortage of such personnel in Mexico was underlined in a report on nurse recruitment. Among the means advocated for overcoming prejudices and misinformation about nursing among potential candidates was early instruction of young women in the advantages of the career, such as promotion opportunities, prerequisites for entering the profession, and fields of specialization.

Environmental Health

Discussions in the environmental sanitation section of the meeting centered on advances in Mexico in the development of potable water systems within the State of Sonora and in Ciudad Acuña, Coahuila. Cited among the factors generating these and other environmental sanitation activities in Sonora was the recent rapid economic and population growth, while accelerated action for water supply development was stimulated by high morbidity and mortality rates related to waterborne diseases. Named as chief inhibitors of the undertaking were the climate, low economic level of the farming sector, and dispersed population.

Progress in environmental sanitation was also reported for Nuevo León, in which a broad and coordinated health education drive is being stressed, and for Reynosa, Tamaulipas, whose population has doubled since 1950. The water supply network, water treatment stations, the sewerage system, slaughterhouses, and street paving in Reynosa were described in detail.

In the field of occupational health, a review was presented on the New Mexico program directed to small industry.

The fact that 14 of the 16 schools of civil engineering in Mexico now offer courses in sanitary engineering was brought out in an account of Mexican efforts to improve instruction of preventive medicine and public health in professional schools. Also reported were broadened opportunities there for environmental health workers to obtain formal training.

Of global interest was the vigorous recommendation that international health organizations focus efforts on a world water supply program, for which the public health need was described as strong.

Control of Venereal Diseases

Coverage of venereal disease control highlighted three points: infectious venereal disease continues to be a serious challenge; casefinding techniques need improving, especially in regard to communications in a bilingual area such as the border; and the proliferation of diagnostic tests is sometimes a source of confusion to the practicing physician. It was pointed out, however, that the new tests have enhanced specificity.

The rapid plasma reagin test excels in accuracy, simplicity, and economy, allowing for prompt diagnosis and thus eliminating the need for followup to find reactors. It is of major value with mobile groups.

Another development has been the identification of gonorrhea in the male with the direct fluorescent antibody procedure. Although testing in the female requires a delayed procedure because of insufficient organisms for immediate detection, results are still obtainable more quickly than with the culture technique.

Four avenues of approach to casefinding were reviewed:

- Twin city control boards assuring for the binational metropolitan areas that all health resources are coordinated toward a unified program. First developed in El Paso-Ciudad Juarez, this approach is now being extended to other twin cities of the border.
- Continuation of the testing and referral program for the agricultural contract laborers.
- Further improvement of contact interviewing.
- Broadening the application of public information methods developed for venereal disease casefinding in the border area.

Trachoma

Described as an important disease on Indian reservations in southwestern United States and in parts of Mexico such as Nuevo León, Tamau-

lipas, and Sonora, trachoma was highlighted by the association in an exhibit with Spanish and English texts and illustrations of control activities showing details of the current project for diagnosis, treatment, and followup in every reservation where trachoma is found. Five more years of intensive programing followed by years of surveillance, are planned.

The eye disease in Mexico was described as characteristically appearing in the acute stage in children and in the intermediate or late stage in adults. In a study of agricultural contract laborers, only 14 of 334 with evidence of trachoma were in the active stage; the rest were in the healed phase. Among Indians with the disease in the United States, blindness occurs in about 1.5 percent. Their active cases are treated with acromycin drops and triple sulfonamides for 3 weeks, or for 6 weeks if the sulfonamides alone are used.

Good results were reported by Sonora health authorities from treating school children and others possibly affected, on the basis of sulfonamides and tetracycline in eye drops and ointments over a period of 2 or 3 months.

Diarrheal Diseases and Nutrition

Control of diarrheal disease was the topic of panel talks devoted to its broad aspects and of roundtable discussions on the disease in the border area. Centering on accounts of local operations in the United States and in Mexico, the participants developed the concept that effective, acceptable projects can be carried out with local resources in the absence of adequate laboratory services.

The correlation between sanitation and low rates of diarrhea points to the need for delineating areas with sanitation deficiencies as targets for control efforts.

Cognizance was also given to the need for adequate symptomatic treatment of acute cases and for instructing mothers to recognize early signs of dehydration. The value of rehydration centers in local health services for the prevention of diarrhea deaths was underscored.

Another presentation described the Yaqui Indian tribe in Sonora in relation to individual and collective health status. Their poverty, primitive economy, use of two languages, attachment to ancestral routine, and geographic location, among other factors, illustrate the complexity of the task of incorporating them into modern life with all the advances in health.

An approach to human nutrition by increasing its adequacy through control of animal disease was emphasized in the veterinary public health section of the meeting. Members recommended that the section's future programs contain more reports devoted to animal diseases affecting the availability of meat.

The Rabies Hazard

The numerous reservoirs of rabies, such as skunks, foxes, coyotes, and bats, along the Mexican border were cited by association members as constituting a real disease hazard. A recent outbreak of rabies in the Imperial Valley-Mexicali area uncovered several hundred rabid dogs and resulted in treatment of at least 400 persons and destruction or vaccination of many thousands of dogs.

Other discussion highlights were that rabies has existed in California in dogs and men since the 1830's and was found in spotted skunks in the 1870's. The past 20 years saw a marked decline in rabies incidence in the United States, largely from the dramatic drop in cases among dogs. Laboratory-confirmed cases among dogs have fallen by 90 percent in the last 50 years. Rabies in wildlife, however, has been rising. The north central area of California has been involved in a rabies epidemic, primarily in the large striped skunk, *Mephitis mephitis*. Probably adding to the rabies hazard are insectivorous bats of the southwestern States. As long as rabies continues in wildlife, eradication is not foreseeable, but public health steps should include mass immunization of dogs and maintenance both of this immunity and of stray dog control. Dissemination of health information is vital, primarily for better handling of bite cases.

The bat rabies picture is still undefined. In the commonest bat species, the infection rate approximates 15 percent. Although there are no known cases of natural transmission to animals, five human rabies deaths in the Nation were associated with exposure to bats, one indisputably with bat transmission.

Tuberculosis and Poliomyelitis

The meeting's coverage of tuberculosis included a presentation of plans for national control of the disease in the United States, in terms of past progress and the opportunity during this decade of reaching the campaign's ultimate stage—that of eradication.

A brief epidemiological review of poliomyelitis in Mexico during 1955–59 indicated occurrence by age, sex, geographic location, socioeconomic level, virus type, and trend. In addition to outlining the 1960 prevention drive, prevention measures, based on the Salk vaccine, gamma globulin, and live virus vaccines, were set forth.

U.S.-Mexico Field Study

A scientific high point of the meeting was an account of a general ecologic survey for arthropod-borne viruses in the Hermosillo area of Mexico. An impressive demonstration of effective cooperation between scientists of the two countries, the project had more than a score of scientists, from all levels of government and from universities and foundations, who finished the fieldwork in early April 1960. Specimens collected in the survey included 11 species of mosquitoes, 124 domestic animals, and some 250 rodents.

Such a study in plateau desert-type terrain gives a broader view of wildlife infection reservoirs that may lead to measures preventing the spread of the infection to other hosts, in this case, the spread of encephalitis to horses and man.

Encephalitis causes a substantial number of human deaths in Mexico, accounting for several hundred recorded cases in 1953–59, as well as of equine fatalities numbering as high as several thousand.

Annual Report in Newspaper Style

Residents of Cattaraugus County, N.Y., received recently an eight-page newspaper devoted wholly to reporting the accomplishments of the Cattaraugus County Health Department during the years 1958–59. The report was delivered by carriers of the 2 daily and 8 weekly newspapers to 37,000 subscribers, almost one-half the population of the county, at less than 5 cents a copy gross cost.

The idea of an annual report in newspaper style was employed by the health department chief in the belief that residents of the county would be more attracted by this form of information about the health services supplied and paid for by their tax dollars. The published report is preserved by some of its readers as a reference.

In planning the project, Dr. Ian D. McLaren, commissioner of health, invited local newspapers to bid on printing the report, with the stipulation that the health department would supply all photographs, charts, and drafts of the text. The *Olean Times Herald* was the successful bidder.

After the written material was edited by a *Times Herald* staff member, the layout was completed in a 10-hour Sunday session by Dr. McLaren and James V. Bronold, business manager of the newspaper.

Each department head checked galley proof of copy covering his jurisdiction. Activities in administration, public health nursing, rehabilitation, mental health, sanitation, and laboratory techniques were reported and illustrated with photographs and charts.

The report was addressed to members of the Cattaraugus County Board of Supervisors. Through the New York State Department of Health, copies were sent also to State senators and assemblymen.

Progress in Reporting Mental Hospital Statistics

Tenth Annual Conference of Mental Hospital Statisticians Bethesda, Md., May 17–19, 1960

THE ANALYSIS of mental hospital patient movement in relation to drug therapy, the evaluation of community mental health programs, and a study of rehospitalization among cohorts of patients released from mental hospitals were among the topics discussed at the Tenth Annual Conference of Mental Hospital Statisticians.

The conference, held in Bethesda, Md., May 17–19, 1960, is sponsored annually by the National Institute of Mental Health, Public Health Service.

Delegates from each of the 22 member States of the Model Reporting Area for Mental Hospital Statistics attended (see box insert). Observers from Georgia, Idaho, Iowa, Maryland, Mississippi, Oregon, and West Virginia were also present, as well as representatives from the Dominion of Canada, Veterans Administration, American Psychiatric Association, Western Interstate Commission for Higher Education, and Southern Regional Education Board.

Drug Therapy and Patient Movement

Since the advent of the widespread use of tranquilizing drugs in State mental hospitals in late 1954 and in 1955, many controlled studies have been conducted to determine the efficacy of various compounds in the treatment of psychiatric patients. Such studies have been carried out on small samples of patients and have been oriented toward determining the effect of a psychoactive drug in relation to that of a placebo on certain specified symptoms.

As a means of supplementing the knowledge gained from these studies the Biometrics Branch and the Psychopharmacology Service Center of the National Institute of Mental Health have a joint interest in determining the effect of drug usage on the movement of mental hospital populations. The questions toward which such studies would be directed are as follows:

1. What are the characteristics of patients who receive drugs compared with those who do not?
2. What is the prehospital drug history of patients?
3. What drugs do patients receive and in what dosage?
4. What is the interval between admission to the hospital and initiation of drug therapy? between the beginning and termination of drug therapy? Is therapy continuous or intermittent?
5. How are the above factors related to patient movement both within the hospital and between the hospital and the community?

It is realized that a difference in outcome between a group of patients who received drugs and a group who did not cannot be attributed to the effect of drugs alone, since there are many factors which determine the selection of patients for drug therapy. However, by examining these differences much can be learned about the experience of patients who did receive

drugs. Also, considerable knowledge can be gained about the selection of patients for drug therapy by comparing their distributions by age, sex, diagnosis, and length of hospital stay with those of patients not placed on drug therapy.

A discussion of current procedures for recording drug therapy information in State mental hospitals revealed that in most States it is not possible at the present time to answer the questions posed above. It was suggested that studies be developed in one or more State mental hospitals to test methodology and to develop recordkeeping procedures which would permit systematic analysis of patient movement in relation to drug therapy. It was further proposed that State mental hospital systems be encouraged to apply for grants to conduct such studies.

Community Mental Health Programs

A discussion was devoted to the effect of the availability and use of various types of community facilities for the mentally ill upon the number and characteristics of patients admitted to State mental hospitals. The importance of obtaining adequate data on patients coming under care in such facilities as general hospitals, community clinics, day care and night care centers, nursing homes, and homes for the aged was emphasized. Due to the increased use of such facilities it has become more difficult to evaluate the effectiveness of State mental hospitals without taking into account the relationship between these hospitals and all of the other facilities in the community which care for the mentally ill. Only a few States are beginning to collect information on patients coming under care in certain of these facilities.

To obtain data on a more comprehensive basis, case registers are now being developed whereby basic information, such as name, address, age, sex, marital status, and diagnosis, is submitted to a central agency for every patient admitted to inpatient and outpatient psychiatric facilities in a defined geographic area. One of these registers also includes reports from the private psychiatrists. Data collected in this way will make it possible to obtain unduplicated counts of individuals by various characteristics, to determine the rates of flow of persons from one facility to another, to study changes in diagnosis from one agency to another, and to provide numerator data for determining the proportion of the population under treatment at a given point in time.

It was agreed that at future meetings more intensive consideration should be given to the evaluation of mental hospital programs within the framework of the other psychiatric treatment programs operating in the community served by the hospital, as well as to the evaluation of these treatment programs themselves.

Cohort Study

A presentation was made of preliminary findings of a study of the experience of patients placed on convalescent leave by the New York State mental hospital system. In this study, each patient who had been placed on convalescent care during 1955, 1956, and 1957 was classified by age, diagnosis, length of time in the hospital prior to placement on convalescent care, and status at various intervals after such placement. He was also classified as to whether he was in the hospital, discharged, or still on convalescent care.

Of the total cohort, approximately 17 percent were in the hospital 1 year after release, and this percentage did not change appreciably within the next 2 years. However, one-quarter of all patients placed in convalescent care had one or more returns to the hospital during the first year, one-third had one or more returns during the first 2 years, and approximately 40 percent during the first 3 years. Among diag-

Model Reporting Area States

Representatives from the following States are members of the Model Reporting Area for Mental Hospital Statistics:

Arkansas	Michigan	Pennsylvania
California	Minnesota	Tennessee
Connecticut	Nebraska	Texas
Illinois	New Jersey	Virginia
Indiana	New York	Washington
Kansas	North Carolina	Wisconsin
Kentucky	Ohio	
Louisiana	Oklahoma	

nostic groups or among age groups, there was no appreciable variation in the proportion in the hospital at specified intervals after placement, but there was distinct variation according to length of time in the hospital prior to placement. For example, among those who had been hospitalized less than 3 months, 10 percent were in the hospital 12 months after placement on convalescent care, compared with 26 percent among those who had been hospitalized 19 months or more prior to placement on convalescent care.

The above study illustrates one method of analysis which will be employed in the cohort study now underway in 20 of the Model Reporting Area States. Collection of data for this study began in 1959 and will continue through 1963. The study will determine not only the hospitalization status of patients at specified intervals of time after release, but will also determine the probability of their staying in the community and of rehospitalization for specific intervals of time after release.

Personnel

Data on mental hospital personnel collected annually by the National Institute of Mental Health and published in "Patients in Mental Institutions" have been considered to be of only limited utility. These data consist of the number of personnel in each State mental hospital system employed in certain specific occupational categories. The members present at the Ninth Annual Conference of Mental Hospital Statisticians in the Model Reporting Area recommended that the Biometrics Branch of the National Institute of Mental Health organize a committee to discuss the problem of collecting adequate data on mental hospital personnel on a national scale. Such a committee, consisting of statisticians, personnel officers, and administrators from several States, met in March 1960, and the report of the meeting was presented at this conference.

There was general agreement among the members of the committee that the inadequacy of currently available data on mental hospital personnel can be classified into two categories: (*a*) the present classification of personnel is inadequate and ill-defined, and (*b*) the ratios of specific categories of personnel to the total resident population of the hospital or a State mental hospital system are inadequate to show the staffing of mental hospitals.

The committee agreed in principle that it would address itself only to those problems relating to the national reporting of personnel data. From the discussion it appeared that the most frequent users of personnel data are the mental hospital administrators, for whom the data had two major purposes: (*a*) administrative, to indicate the need for additional personnel and to use in the presentation of budget material to the legislature; and (*b*) program evaluation, to compare staffing patterns among hospitals and among State systems in relation to measures of patient movement.

The committee chose as its major task the development of a first draft of a revised personnel classification. In so doing the members agreed that only those categories of most interest to the users of the data should be listed specifically and that those remaining be placed in an "all other" category. It was also agreed that part-time personnel should be classified according to the number of equivalent full-time positions they occupied. It was decided that since certain personnel performed several functions in some hospitals it would be more useful to classify personnel according to major function. For example, medical directors and assistant superintendents who are also psychiatrists would be classified as psychiatrists rather than under the former categories. Each category of personnel would then be subdivided according to professional and special training qualifications.

Considerable interest was expressed by the committee in the routine reporting of data on personnel turnover. It was suggested that for each category of personnel the following items be reported: number employed at beginning of year, number added during the year, number leaving employment during the year, and number employed at end of year. A personnel turnover ratio could then be computed by dividing the number of personnel leaving employment during the year by the average number employed during the year.

The conference participants agreed that the work of the committee represented a meaning-

ful start in the revision of the personnel reporting form. Some doubt was expressed, however, as to whether existing personnel records in some State mental hospital systems would permit the tabulation of personnel in the proposed categories. The group supported a recommendation of the committee, namely, that the Biometrics Branch develop specific definitions for each category in consultation with experts in the field, and that these definitions then be distributed among the States for comments and suggestions.

Other Problems

A brief report was presented of the developments of the study being conducted jointly by the National Institute of Mental Health and the mental health authorities in two States to determine the socioeconomic and family characteristics of patients admitted to all psychiatric facilities serving residents of these States and to compare these characteristics with those of the general population of these States as enumerated in the 1960 census. The facilities included are public mental hospitals, private mental hospitals, Veterans Administration hospitals, general hospitals with psychiatric facilities, and outpatient psychiatric clinics. The main objective of the study is to determine the extent to which population groups with different characteristics use the various types of psychiatric facilities.

This study is aimed at considerably enlarging present knowledge about the rates at which patients from different population groups come under care of psychiatric facilities. Heretofore, most of the investigations of this type have involved only patients admitted to public mental hospitals and have dealt only with a limited number of patient characteristics which could be related to the published U.S. census data on population characteristics, such as age, sex, color, marital status, and urban-rural residence. In contrast, the present study will encompass patients admitted to all types of psychiatric facilities and will include data on the patient's family, such as family composition, family size, patient's relationship to family head, and the characteristics of the family head, as well as other characteristics of the patient.

These detailed data will be obtained directly from the 1960 U.S. census schedules. To accomplish this the hospitals and clinics will furnish the following information on each patient admitted during the period June 1, 1960, to May 30, 1961: name, age, sex, race, and address at time of admission, as well as address and name of head of household in which the patient resided at the time of the U.S. census on April 1, 1960. This information will enable the Bureau of the Census to locate the appropriate census schedules in their files. Demographic and socioeconomic data on patients and their families will be transcribed from the census schedules and tabulated. A special arrangement with the Bureau of the Census to provide the study group with unpublished tabulations on the detailed family characteristics of individuals in the general population will permit, for the first time, computation of rates according to these characteristics.

A more limited aspect of this study is underway in two additional States where only patients admitted to public mental hospitals are being studied. The socioeconomic and family data for these patients are being obtained by a direct interview of each patient or his respondent rather than from the 1960 census schedules. Aside from providing data on segments of the population admitted to the public mental hospitals, this study will also provide a good test of the feasibility of obtaining fairly comprehensive data on mental patients by the interview method.

Since the majority of those present at the conference are responsible for collecting and analyzing data on outpatient psychiatric clinics, a workshop was devoted to that topic. The following needs were expressed with reference to data collected from these facilities on a national basis:

1. Further standardization of recording and reporting patient data and clarification of some of the definitions.

2. Classification of outpatient clinics to provide national tabulations for comparable facilities.

3. Data on additional aspects of clinic activities which would permit the evaluation of the role of these facilities in the overall mental health program.

The group agreed that the Biometrics Branch should continue to meet with State and regional representatives in an attempt to achieve these objectives. They suggested that, in reevaluating existing procedures for reporting on patients served, special emphasis be given to the following problem areas:

1. Diagnostic categories for special groups, such as children.
2. Psychiatric description by professional personnel other than a psychiatrist.
3. Procedures for categorizing the problems or symptoms which lead to clinical referrals and for relating these to diagnosis or description.
4. Procedures for reporting patients not under active treatment.

Regional Meetings

The Fifth Midwest Conference on Mental Health Statistics was held in St. Paul, Minn., on October 8 and 9, 1959. The major topic was a proposed project on factors affecting admission of aged patients to the State mental hospitals. After considerable work by a committee it was decided that the study would be conducted in two phases. The first will be a cohort study of patients 65 years of age and over admitted to the State mental hospitals, in which certain characteristics and background data on these patients will be related to probabilities of their release from or death in the hospital during specified periods of time subsequent to admission. This phase of the study, in which approximately seven States will participate, will be based on data usually obtained as part of the routine admission procedures of the hospitals.

The second phase of the study will involve collection and analysis of more complex data. Among the factors to be considered are the socioeconomic characteristics and living arrangements of aged patients admitted to mental hospitals, the kinds of care they require, and the kinds of care the hospitals are able to provide. It is likely that each of the two or three States which will participate in this phase will study a single aspect of the problem and, through correspondence and contacts, attempt to coordinate their efforts in such a way that results from one aspect of the study will be useful in interpreting those from another.

As a result of an interest in program evaluation expressed by the directors of the mental health programs in the 16 States served by the Southern Regional Education Board, the first annual meeting of the Southern Regional Conference on Mental Health Statistics was held in Atlanta, Ga., on January 26–28, 1960. This meeting was attended by persons representing the statistical reporting programs of the mental health department in each of the 16 States. Objectives of the group were formulated as follows:

1. To work toward gaining comparability in mental health statistical data and uniformity in reporting these data based on standard definitions already developed by members of the Model Reporting Area, with a goal of all States in the region becoming members of the Model Reporting Area.
2. To facilitate interchange of comparable statistical data among the States in the southern region.
3. To provide a medium for the exchange of ideas and papers on research and methodology.
4. To foster cooperation in the design and preparation of studies of significant mental health problems.
5. To encourage better communication between the statistician and the mental health administrator and between the statistician and the clinician to accomplish the best use of statistical data for program planning, administration and evaluation, clinical research, and presentation to the general public.

It is planned that this group should meet annually and that it should ultimately develop a series of cooperative research projects of special interest to the mental health program in that region.

Reevaluation of Model Reporting Area

During the course of the first 10 meetings of the Model Reporting Area for Mental Health Statistics a substantial proportion of the time has been devoted to the development of uniform definitions of terms describing patient movement and to the production of uniform tabulations. Considerable progress has been made in this direction. Since its inception, the Model Reporting Area membership has grown from 11 to 22 States and it is expected that

several additional States will become members within a short time. Each of the member States has adopted the uniform definitions which have been developed and refined over the years.

In view of the increased membership and the repeated recurrence of certain problems related to definitions, a committee on definitions was appointed to be responsible for receiving and making recommendations on problems of implementation or revision of the definitions now in use and in the development of new definitions in areas where none exist. A committee on program planning was appointed to determine ways in which more effective use can be made of the annual meetings. It was the general consensus of the group that more time should be devoted to individual workshops which would be oriented toward the development of tools for the evaluation of mental hospital programs.

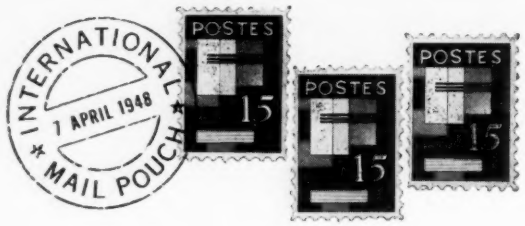
Examples of problems to be considered by the program planning committee are as follows:

1. Methods of analyzing the movement of patients in relation to the use of specific types of therapy.

2. Methods of relating patient movement data for State mental hospitals to the use of other facilities for the mentally ill in the community.

3. A study of the role of the mental hospital in the care of aged persons who become mentally ill.

The committee will select problems of crucial importance to State mental hospital programs and will suggest methods by which the Model Reporting Area can approach these problems most effectively.



The Devil in the Valley

In the rich farming region of Haiti's Artibonite Valley is the Albert Schweitzer Memorial Hospital, supported and operated by a U.S. foundation. The hospital provides medical care of a quality equal to that in good hospitals in the United States, but its facilities are swamped with patients with preventable diseases and its administrators would like a preventive medical program in the valley.

Early in 1960, 37 babies were hospitalized with tetanus of the newborn, and the hospital's records show an increase in the number of cases in the previous year. At the request of the hospital's nursing director, a nurse of the Inter-American Cooperative Public Health Service (SCISP) conducted an informal survey of the incidence of tetanus of the newborn in the area.

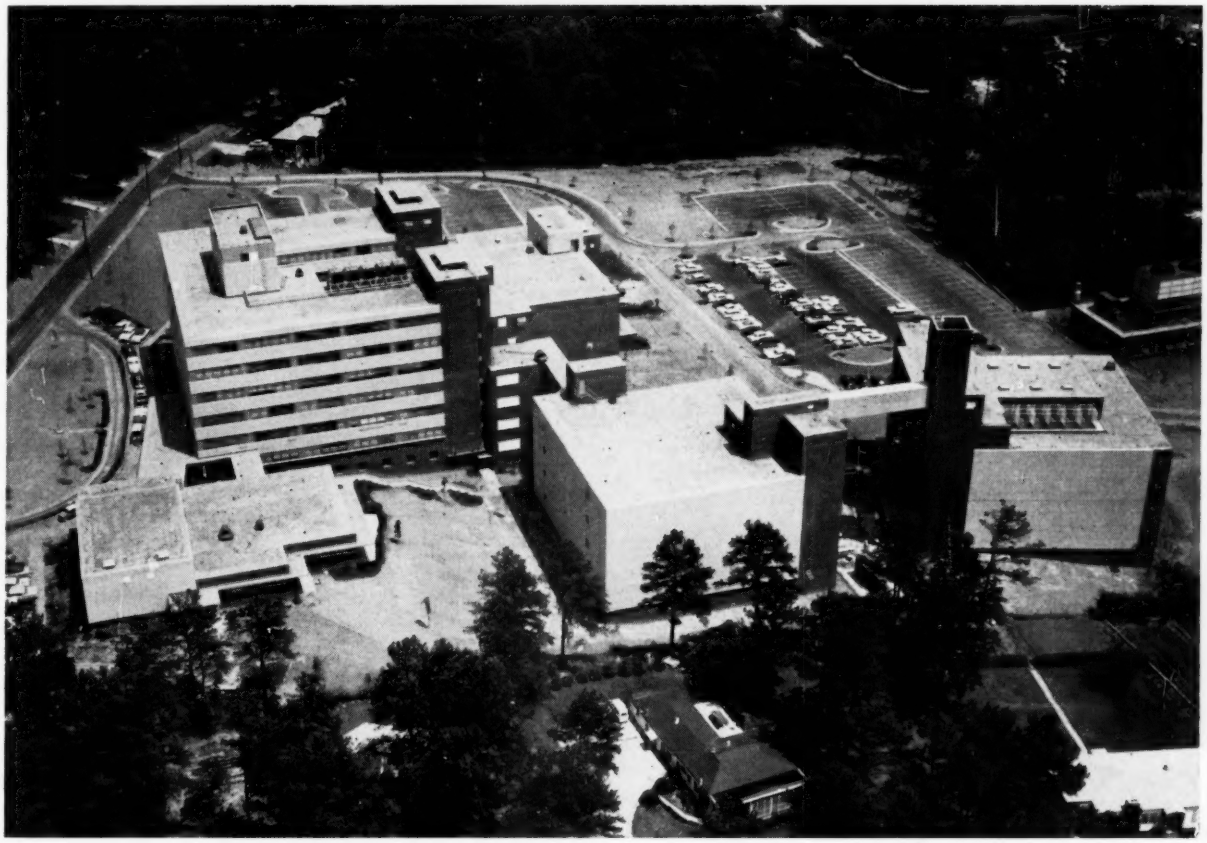
Accurate statistics on the Artibonite Valley do not exist, but the nurse talked with 200 mothers. Of 2,109 pregnancies, only 809 children were alive. From the mothers' descriptions, it appeared likely that most of the deaths were caused by tetanus.

The mothers are convinced that the chances for even a normal child to live are very small, the nurse reported. "For some, the devil's spirits in the region are very powerful, and the tetanus crises and convulsions are due to possession of the babies by the devil's spirits."

With the concurrence of Haiti's Minister of Public Health SCISP has appointed a medical coordinator for public health activities in the valley. Aside from the hospital, the only facilities there are one SCISP clinic-dispensary and several small dispensaries operated by the ministry. These have been devoted primarily to curative services.

Representatives of the ministry, the development organization for the Artibonite Valley, the U.S. Operations Mission, the hospital, and SCISP have agreed to establish and operate a field training center in the vicinity of the hospital where recent graduates of the medical and nursing schools and employees of the ministry will spend several weeks. The plans include a health center building, dormitories for trainees, and housing for a physician, sanitarian, and nurse.

—EDWARD E. MINTY, *acting chief, division of public health, U.S. Operations Mission, Haiti.*



This is an air view of the new headquarters facility of the Communicable Disease Center, Public Health Service, in Atlanta, Ga. It occupies 15 acres adjoining the campus of the Emory University—ground that was donated to the Service by Emory about 10 years ago. The plant comprises the main building (*upper left*), which houses the administrative offices of the Center and of the five branches (epidemiology, laboratory, technology, training, and venereal disease), together with many of the laboratories; the auditorium and cafeteria (*lower left*); the infectious disease laboratory building (*right center*); and the virus disease laboratory building (*right*). The building for audiovisual and related activities is back of and partially hidden by the main building. The facility was occupied by CDC about July 1, 1960, and was formally dedicated on September 8.

Highlights From the 1959 Report of the Communicable Disease Center

CDC continued to serve as the International Shigella Center, the National Shigella Center, the National Escherichia Center, the National Salmonella Center, and the National Typhoid Phage-Typing Center. A new serologic test to detect typhoid carriers should prove useful in screening large numbers.

A Staphylococcus Surveillance Unit was established as a coordinating center for information, to maintain liaison with the many investigators in the field, and to answer specific questions, compile references, and review the various directives and reports.

An increase was seen in the overall incidence of the venereal diseases during 1959, and the continuing rise in primary and secondary syphilis was sharply accelerated. To stimulate more complete and more uniform reporting, CDC designed a Standard Venereal Disease Epidemiologic Report Form, to replace the 48 different forms used by the States.

In Puerto Rico, a serious epidemic of scarlet fever began in early 1958 and continued well into the summer. Following the elevated incidence of streptococcal infection

acute glomerulonephritis occurred. All evidence pointed up the need for strengthened surveillance of streptococcal diseases and acute glomerulonephritis in Puerto Rico.

The list of known disease-producing organisms and their serotypes is well over 1,000. Diagnostic reagents were commercially available for about 100 disease agents.

New courses developed and presented included epidemiology and control of vector-borne diseases; epidemiology for veterinarians; milk-sanitation administration; venereal disease control and epidemiology for nurses, and a medical parasitology extension course.

Mounting evidence indicates that histoplasmosis is contracted by exposure to the fungus at localized point sources rather than by inhalation of infected air in the general atmosphere of the surrounding area.

In ringworm studies, results indicate that griseofulvin exerts marked curvative effects, with few individuals showing signs of toxicity. It appears possible to eliminate a major source of *Microsporum canis* infection in humans by controlling infections among cats in cat-breeding establishments. Experimentally, this was accomplished by giving the animals griseofulvin orally and using "Captan" solutions as a dip for them and a disinfectant for their environment.

At Bangor, Maine, where essentially no cases of hepatitis had been seen during the previous 2 years, eight adults with severe infections were found to be patients of a single physician.

During 1958, 5,787 cases of poliomyelitis were reported to the National Office of Vital Statistics, an increase of about 5 percent over 1957. There was almost a 50 percent increase in the number of paralytic cases. About half the paralytic poliomyelitis was in children under school age. In contrast, during 1952 and 1955, before widespread use of the vaccine, school-age children were most severely involved. The proportion of persons who are adequately immunized is markedly lower in the low socioeconomic areas. School children between the ages 5 and 14 years are the best protected. Continuing studies on poliomyelitis-like diseases showed that paralysis can be caused by enteroviruses other than polioviruses, but it tends to be milder and is usually reversible.

To test the possibility that insectivorous bats may serve as asymtomatic carriers of rabies, 200 were collected and their salivary glands and brains tested for virus. One bat that had virus in the saliva when captured survived for 6 months. Another bat, kept under observation in confined isolation, showed virus in the saliva at the end of a 17-month period and survived an additional 4 months. Similar studies of terrestrial vectors showed no asymptomatic carriers among these animals.

On the basis of critical dosage level and survival time of roof rats fed different concentrations of rodenticides in yellow cornmeal, Diphacinone appeared to be a more effective poison than warfarin or Pival.

Streptococcal infections were a prime target in fluorescent antibody work. An effective reagent was developed and methods for its routine production were refined. Studies on 350 patients proved the method as sensitive and specific as conventional procedures, yet requiring only 2 to 3 hours in contrast to the usual 3 to 5 days. (See *Public Health Reports*, February 1960, p. 125, for a report on fluorescent antibody tests for gonorrhea in women.)

There were 2,587 cases of infectious encephalitis reported for 1958, a 21 percent increase, and 344 of them were identified as arthropod-borne infections.

Although immunizing against pertussis is widely practiced in this country, more than 30,000 cases of the disease are reported each year. The most serious illnesses are in babies under 1 year of age. CDC developed a hemagglutination test as a means of measuring antibody response to the vaccine. Newborn infants indicated an ability to produce antibodies as readily and in as high titers as older individuals.

Air Pollution

CONFERENCE REPORT

As public interest and concern over air pollution increases, scientists and technicians are devising ever more sensitive techniques for measuring pollution and its effects. These techniques range from sampling devices mounted on aircraft to time-lapse photography of low-level inversions to gauging the cellular and subcellular effects of pollutants on experimental animals.

To further the exchange of information on current research, methods, and findings, the Public Health Service sponsored the Third Air Pollution Research Seminar held in New Orleans on March 22–24, 1960. Summaries of the 81 papers given at this forum are presented in the following pages. The full proceedings of the seminar will not be published since most of the authors have published or are in the process of publishing complete accounts of their work. Individual authors should be contacted directly for more detailed information on specific projects.

International Aspects

Dr. Christian E. Junge, Air Force Cambridge Research Center, Bedford, Mass., discussed the continental and global aspects of air pollution. He said that the concentrations of two atmospheric constituents, carbon dioxide and sulfur dioxide, have increased on a global scale as a result of human activity. Any fluctuations in CO_2 concentration will have a profound influence on world climate. While the CO_2 concentration has increased but 10 percent since the age of industrialization, it has been estimated that the increased use of energy by the turn of the next century may result in an alarming CO_2 concentration in the earth's atmosphere. The sulfur concentration has increased much more because of the lower natural level in the earth's atmosphere. Recent measurements of sulfate in rainwater show higher concentrations in inland and northeastern parts of the United States, which may be associated with comparable industrial activity, Dr. Junge said. Because of the complex "washout" mechanism, care must be taken in interpretation of rainwater concentration in relation to air concentration; broadly speaking, however, air con-

centration and rainwater concentration are parallel. On a global basis, 30 percent of the sulfur "injected" into the atmosphere is a result of human activities.

Dr. Morris Katz, Department of National Health and Welfare, Ottawa, discussed air pollution research in Canada. Studies are in progress to evaluate the extent of air pollution from common gaseous and aerosol contaminants in various parts of that country. Studies involving industrial emissions concern the pollution of the atmosphere by fluorides, hydrogen sulfide, sulfur dioxide, and organic sulfides. An assessment of the components of exhaust gases from locomotive diesels, considering various operating conditions and fuel types, has been undertaken. An assessment is being made of the carcinogenic hydrocarbons and other organic compounds in smoke and particulates of urban air and in automobile and diesel exhaust gases. A national air sampling network is being organized to correlate and exchange data. A meteorological tower has been equipped in Ottawa, together with a number of air sampling stations throughout the city; data will be correlated with source evaluations within each city block.

Arthur C. Stern, Air Pollution Division, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, described air pollution research in Europe. In Great Britain, he said, air pollution research efforts are concentrated on the smokeless combustion of solid fuels, development of smokeless fuels, behavior of steam power plant stack fumes, etiology of chronic bronchitis, and the general problem of sulfur oxides in the air. In West Germany, a large research program has been initiated, with emphasis on the SO_2 cycle (formation, emission, diffusion, and effects on vegetation), the measurements of air pollution, the meteorological parameters associated with pollution dispersion, and the properties of dusts and aerosols. The major research effort in Belgium is related to air pollution effects upon vegetation and upon man, measurements of air quality, and meteorological and climatological aspects of air pollution. The major activities in Italy are studies of carbon dioxide, sulfur dioxide, and particulate matter, and investigations of lead and polynuclear hydrocarbons. The major research in France relates to the measurement of air quality in the city of Paris. Air pollution research effort in Europe is comparable to that in the United States in size and scope. In the United States, research results are rapidly disseminated; in Europe, however, language and political barriers not only impede dissemination of results but lead to duplication of effort.

Dr. Benjamin S. Levine of Washington, D.C., reported on air pollution research in the U.S.S.R. Research in air pollution began some time ago in central and widely scattered sanitary hygienic and occupational health institutes. At first, attention was centered almost entirely on workroom, shop, and production plant air. Community air pollution research was initiated some years later, and standard allowable limits were adapted on an arbitrary, but temporary basis. Without waiting for results of time-consuming investigations, limits of allowable atmospheric air pollution were accepted as one-third of the limits adopted for factory air for corresponding pollutants. As research progressed and rational data were accumulated, arbitrary standards were amended or replaced. In addition to clinical research and experimental animal studies, research has

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This summary of proceedings at the Third Air Pollution Research Seminar was edited by Dr. Roy O. McCaldin, Air Pollution Engineering Research, Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio. Section reporters were John S. Nader, Sampling and Identification; Robert A. McCormick, Meteorology; Dr. C. Stafford Brandt, Effects of Air Pollution; Frank E. DeMartini, Engineering; Elbert C. Tabor, Environmental Levels of Pollutants; Andrew H. Rose, Jr., Automotive Exhaust Research; and Dr. James P. Lodge, Jr., Chemistry, all of Air Pollution Engineering Research.

Also, Ralph C. Graber, International Aspects, and Robert Porter, Community Studies, both with the Air Pollution Engineering Branch, Washington, D.C.; Dr. Thomas R. Mazzocco, Pulmonary Physiology, and Dr. Glen A. Fairchild, Pathology, both with the Air Pollution Medical Branch, Washington, D.C., and Dr. Herbert E. Stokinger, Toxicology, of Occupational Health Field Headquarters, Cincinnati.

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been undertaken which relates to the development and application of methodology for air pollution measurement. The general approach has been to assign the investigation of a given pollutant to a specific institute. The institute was expected to study all aspects of the pollutant—its sources, concentration, and pathophysiological effects—and to recommend a safe limit of emission into the atmospheric air. In the development of allowable limit concentrations for specific pollutants one unique aspect of Soviet research has been the application of aberration measurements of conditioned reflexes during experimental exposure of animals to different pollutant concentrations. By these and other methods limits of allowable concentrations have been set for 30 industrial air pollutants in the U.S.S.R.

Sampling and Identification

Dr. James P. Lodge, Jr., reported for Gifford M. Mast, Mast Development Co., Inc., Davenport, Iowa, on the microcoulomb ozone sensor, a recent compact instrument development in ozone sensing and monitoring. The principle of operation, originally developed by Dr. Alan W. Brewer of Oxford University, consists of an oxidation-reduction reaction of ozone in an airstream sampled over a film of buffered potassium iodide. The flow of electrons released in the reaction results in a signal output continuously monitored on the instrument's millivolt recorder with full-scale calibration of 0–100 parts per hundred million of ozone by volume. The reaction time built into the instrument tends to make the analysis specific to ozone, but a small amount of interference is produced by nitrogen dioxide and sulfur dioxide, which are normally found in atmospheric air.

Robert Lindsay reported for J. C. Beckett of the Wessix Electric Heater Co., San Francisco, Calif., on a new method of measuring ion mobility distribution which offers another index of air pollution. The instrumentation consists of a radioactive ion generator to pre-ionize the air sample, a standard parallel plate type ion collector, an ion trap to selectively remove high mobility ions, a stepping switch for automatic operation, and a micromicroammeter and recorder. Measurement can be made of the mobility of air ions, in the range of values from 4 to 0.052 cm. per sec. per volt per cm. for concentrations as high as 5×10^5 ions per cc. Ordinary clean air was found to contain small ions (millimicron size) having a mobility greater than 0.1 cm. per sec. per volt per cm., while typical urban air pollution depressed the number of small ions and increased the number of intermediate ions (3 to 50 millimicron size range) in the mobility range from 0.1 to 0.002 cm. per sec. per volt per cm. The small ions were thought to be clusters of O_2 and CO_2 molecules with excess charge, intermediate ions to be larger clusters, and large ions (0.05 to 1 micron) to be dust particles. The large ions might also be atmospheric condensation products consisting of salt particles such as $(NH_4)_2SO_4$. There was no information on the question of the effect of relative humidity on the type and amount of charge taken on by the ions.

Dr. Robert Baker, Laboratories for Research and Development, The Franklin Institute, Philadelphia, Pa., presented a study of sampling techniques to determine the effects of various storage techniques and materials on known concentrations of gases sampled from the atmosphere. Gases were monitored at varying storage time intervals, using a 10-meter cell infrared spectrometer and gas chromatographic procedures. Compression storage in steel cylinders at 150 psig resulted in high loss of mineral oxides (SO_2 and NO_2) in the compressor and little loss of hydrocarbons. Storage at atmospheric pressure in steel cylinders showed no significant loss in either case while comparable storage in glass flasks showed high loss for SO_2 and NO_2. Storage in polymeric film fabricated bags at atmospheric pressure showed that soluble mineral oxides were affected by chemical reaction and moisture permeability, and hydrocarbon loss was sustained by gaseous diffusion. The two-film bag was recommended, the inner film as impermeable to the gas of interest and the other film to moisture. Of the plastics studied aluminized-Mylar was found to be the least permeable to moisture. A dark reaction did not occur after 46 hours of storage of a mixture of SO_2 NO_2 and 2-pentene.

Helmut K. Weickmann, U.S. Army Signal Research and Development Laboratory, Fort Monmouth, N.J., discussed aerosol measure-

ments in Greenland conducted in areas near the coast and in the interior in July 1957, March 1958, August 1958, and August 1959. In the summer, particle concentrations near the coast and permafrost soil were found to vary from less than 100 to more than 1,000 particles per cubic centimeter in the diameter size range from 1 millimicron to 1 micron. Upwind of sources of contamination, about 200 miles inland from the coast and over the icecap, the concentration was in the neighborhood of 1 to 3 particles per cubic centimeter in a narrow size range of about 1 micron diameter. The Aitken, Rich, and Pollak nuclei counters were used as well as the cascade impactor and the Goetz spectrometer for collection and measurement of such small particles at these extremely low concentrations.

Morris A. Fisher, Armour Research Foundation, Illinois Institute of Technology, Chicago, discussed studies on particulate air pollution in terms of the problems of sampling, analysis, and correlation of data. These problems were discussed in relation to brief summaries of particle count and size measurements with the Aerosoloscope (a light scatter analyzer), directional sampling of suspended dust, the use of the electrostatic precipitator for sampling and quantitative separation, and of studies of radioactive fallout, its separation in the dry form, and the interaction of small particles with a water drop.

Dr. Walter C. McCrone, Walter C. McCrone Associates, Chicago, reported on the characterization and identification of smoke and fly ash by means of the microscope, a study in which various types of particulate air pollutants are characterized by microscopic morphology. Photographs are being made under standard conditions of as many as possible of the different types of particles found in wind erosion products, industrial dusts, and combustion products for compilation in an atlas which will include the history of the end product. There are indications that various sources of smoke and fly ash can be unequivocally identified. The morphology of these particles is found to depend upon the type of fuel, equipment, and operation used in the combustion process. These methods can be used to obtain information on the percentage of smoke and fly ash contributed by various sources, the geographic distribution of fly ash from a given industrial stack, the percentage of smoke and fly ash in total settled or suspended dust samples, and the operating efficiency of a given industrial stack.

Dr. Harold L. Helwig, California State Department of Public Health, Berkeley, discussed particle sizing and analysis in community air pollution studies in which he emphasized the need of data on the physical and chemical characteristics of particles in polluted air for the elucidation of questions about various air pollution effects. The Goetz particle spectrometer was studied as an instrument suitable for field use and for collection and analysis of submicron particles with minimal change in their properties. Modifications of the instrument were made to overcome rotor heating by circulation of coolant fluid and to reduce bypass flow of sample air around the centrifuge rotor by means of a self-contained system of pressure compensation. Efficiency of particle collection, using polystyrene latex spheres dispersed by an aspiration technique developed in the study, was found to be 100 percent with an accuracy of ± 15 percent for the diameter size range from 0.2 to 1 micron and for airflow rates up to 12.5 liters per minute. Dr. Alexander Goetz, California Institute of Technology, Pasadena, reported that his work showed this efficiency to extend down to 0.08 microns and also indicated that newer models of the spectrometer were modified to compensate for bypass airflow.

Charles W. Gruber, air pollution control and heating inspection, Cincinnati Department of Safety, reported on the Scentometer, an odor-level measuring device, developed as the result of a Public Health Service grant on techniques of urban odor measurement. The Scentometer is a portable instrument utilizing the human respiratory system as the source of suction for sampling ambient air and containing an activated charcoal layer to furnish "odorless" air and a system of orifices calibrated for various airflow rates. The measurement technique consists of diluting the odorous ambient air with odorless air to a minimum detectable threshold level. Results are reported in whole numbers as dilution to threshold (D:T) by the observer, where the number is the sum of the parts of odorless air required to dilute one part of odorous air to threshold plus the part of odorous air. The current model of the Scentometer

has been designed with five dilution orifices which give the D:T values of 1, 2, 8, 32, and 128. The value of 8 was found to represent borderline cases of odor complaint in the field. Values of 32 and 128 were definitely odor problems. Odor from the activated charcoal itself did not interfere with the observer's evaluation, and the charcoal failed to render odorless any ambient air having coffee roasting odors. To avoid the problem of fatigue, the device is used initially at high dilutions and then at higher concentration values. Additional study is being conducted on the variability in sensitivity of individual observers. The device's potential as a tool for the enforcement of ordinances appears to have been realized; the use of a similar device was reported to have been written into the ordinances of two county control agencies.

Meteorology

Frederick E. Bartlett, meteorologist, Brookhaven National Laboratory, Upton, N.Y., described the use of oil fog and radioactive materials as tracers in long-range diffusion studies. These techniques have been developed for concentration measurements in a plume from a single source out to distances of 30 to 40 miles from the Brookhaven site. The sampling devices were mounted on a light aircraft which made passes through the plume, normal to the axis, at various elevations and distances from the source. The greatest practical problem in the experiments was the exact positioning of the aircraft in space when traversing the plume. During stable conditions the apparent diffusion of the plumes was less than that expected by the investigator.

Irving A. Singer, meteorologist, Brookhaven National Laboratory, Upton, N.Y., reported on preliminary analysis of peak to mean surface concentration ratios of pollutants from an elevated source. At distances of 1 to 2 kilometers, values on the order of 4 were found in high-wind conditions and 14 or 15 in convective regimes at Brookhaven National Laboratory. These ratios were noted to be in agreement with similar data obtained elsewhere, but higher than those to be expected of pollutants in urban areas.

Dr. Francis E. Gartrell, Tennessee Valley Authority, Chattanooga, Tenn., reported on dispersion of stack gases. SO_2 concentrations were measured during stable atmospheric conditions in plumes up to 10 miles from the source, a TVA power plant, by means of a Titrilog adapted for operation in a helicopter. This revealed that the concentrations are nearly normally distributed in the crosswind and vertical dimensions. At all distances the ratio of the maximum to average concentrations was nearly constant. On a number of days substantial decreases, in the order of 20–40 percent, in a total SO_2 flux in successive plume cross sections were found at distances 1 to 6 miles and for time periods of 60 to 80 minutes. These losses may be only apparent and due to the difficulty of obtaining accurate estimates of SO_2 flux at greater distances. However, laboratory experiments measuring the extent of SO_2 oxidation were in agreement with the order of magnitude of the SO_2 loss observed in the plumes.

Sidney R. Frank, Aerometric Research, Inc., Santa Barbara Airport, Goleta, Calif., used time-lapse photography from an elevated vantage point near Santa Barbara to investigate the fine structure of low-level inversions. Observations of the top of stratus clouds in the marine layer indicated that the top of the stable layer was not as smooth and uniform as might be expected, but was marked by a complicated eddy structure. Further, several "stability levels" were to be found within the "gross" stable layer which can trap urban contaminants and subject them to differential relative horizontal movements. It was noted that information concerning the mean height of the inversion base could be obtained by monitoring the signal intensity from a television station in San Diego, some 200 miles away. This results from the significant correlation between the TV signal intensity and the height of the electromagnetic-ducting layer associated with the inversion base.

Donald H. Pack, meteorologist, U.S. Weather Bureau, Washington, D.C., reported on progress in the development of metalized Mylar constant-level tetroons (tetrahedron-shaped balloons) which could be tracked by radar. Experiments to date indicated that the motions of the tetroons could reasonably be identified

with motions of air parcels of comparable volume, and reliable information could be obtained of air trajectories and of the structure of turbulent flow following the fluid motion (that is, Lagrangian statistics). Daytime flights, 10 to 100 miles in extent and at elevations of a few hundred to a few thousand feet, showed the variance of the lateral component of the motions to exceed the vertical by about a factor of 4, while maximums of the turbulence spectra, converted empirically to a local time equivalent, were in agreement with findings of other workers. With prior knowledge of the vertical temperature structure in the atmosphere, the tetroons could be positioned within plus or minus 200 feet of any desired altitude.

Dr. Jack E. Cermak, professor of mechanics and civil engineering, Colorado State University, Fort Collins, Colo., reported on diffusion from a point source in a wind tunnel test section. It was found that in simulated atmospheric instability conditions the effect of surface roughness was to decrease the rates of diffusion, in both the lateral and vertical direction, from that observed when the surface was smooth. It was tentatively hypothesized that the surface roughness broke up large-scale turbulence of pure convective motions into smaller scales less effective for diffusion. The existence of intermittent vortexes in the flow emerging out of the boundary layer was also noted. These vortexes were on time scales of the order of hundredths of a second and were not noticeable in the mean velocity profiles.

Raymond Smith, chief, air pollution control section, Philadelphia Department of Public Health, reported on the urban atmosphere's ability to renew and purify itself. This was revealed during an investigation of natural ventilation rates over Philadelphia. He concluded that the influence of prevailing winds on the air pollution situation in the city was largely beneficial, as maximum pollutant concentrations were associated with winds from other directions. On the average, 45 periods of short duration and 1 long period (2 to 3 days) of low ventilation conditions are experienced per year. A somewhat more favorable picture had been suspected prior to the study.

Dr. E. Wendell Hewson, professor of meteorology, University of Michigan, Ann Arbor, described a system for forecasting dispersion of ragweed pollen. Data for 1959 were used to establish a technique to predict the daily departure from the normal of the ragweed pollen concentrations. A statistical study using a correlation matrix of 18 parameters revealed that wind direction, maximum temperature, and dew point were the best predictors and hence were utilized in the system of testing on independent data during the 1960 season.

Pulmonary Physiology

Dr. Richard Ehrlich, Armour Research Foundation, Chicago, discussed the effects of atmospheric pollutants on susceptibility to respiratory infection. The specific pollutant used during the present phase of the investigation was ozone and the micro-organism causing the infection was *Klebsiella pneumoniae*. In the preliminary phase of the program the virulence and viability studies of the organism were conducted to determine the LD_{50} for mice. Experimental conditions included exposure of Swiss albino mice to ozone prior to the challenge with bacterial aerosol and aerosol challenge prior to ozone exposure. In every case the mortality was greater for mice previously exposed to ozone. An exact recovery time was not determined, but on one occasion a delay overnight before insulting with bacteria still caused an increase in mortality. Dr. Ehrlich speculated that ozone might have its activity embodied in an anesthetic action on the cilia.

Dr. Ben V. Branscomb, University of Alabama Medical Center, Birmingham, reported on the measurement of pulmonary function in epidemiological surveys with the Wright peak flow meter, McKesson Vitalor, Monaghan puff meter, Collins 13½-liter spirometer, and a special high frequency spirometer with oscilloscopic recorder. These devices were installed in a bus in which 24 different measurements were carried out on volunteers. The studies included maximal inspiratory and expiratory efforts with airflow recorded in relation to volume within the vital capacity. These "maximum flow-volume" loops were found to be easy to calibrate and analyze. From these loops all measurements available from the other pieces of apparatus, except the maximum breathing capacity,

could be calculated. In some individuals whose conventional ventilatory measurements were normal, the contour of the flow-volume loop was abnormal. These changes were attributed to increased airway resistance suggestive of early pulmonary disease. The findings suggest that flow-volume loops may identify early lung diseases not apparent from other measurements. Dr. Branscomb stated that his major objection to any type of peak flow measurement by conventional instruments was that no measurement of function near the end of expiration was made and that this area was probably the most important in detection of early disease.

The high frequency spirometer with oscilloscopic recorder was the subject of considerable discussion because of its possible adaptation to field testing. The present apparatus could be reduced in size by use of transistorized circuits, but even in its present form it is transportable by bus or trailer. The cost was approximately $15,000, which is lower than a portable X-ray unit. The respiratory loops can be obtained at the rate of one person every 3 minutes and are easy to record and develop.

Dr. James E. Long, University of Pittsburgh, Pittsburgh, Pa., investigated pulmonary impairment from deep lung irritants in rats by measuring the rate of respiratory uptake of carbon monoxide –C^{14} and oxygen at hourly intervals after a half-hour exposure to phosgene. The magnitude of impairment increased sharply above 2.0 ppm phosgene.

Oxygen deficit and carbon monoxide deficit were defined as the ratio of normal consumption (adsorption) to noted rate of consumption (absorption) at a specific time following pulmonary insult. Since it was noted there was an oxygen deficit, the question was raised whether the metabolic rate had been lowered. Dr. Long explained that the blood oxygen saturation studies by intracardiac puncture indicated the difference was not due to metabolic rate, but to inability of oxygen to diffuse, presumably because of edema. The oxygen deficit was noted to be less than the carbon monoxide deficit. This was explained on the basis that the oxygen absorption was partially dependent on pulmonary blood flow, while carbon monoxide was not.

Secondary insult exposures were imposed after edema had developed due to damage from nitrogen dioxide or phosgene at concentration levels producing 25 to 30 percent mortality. The secondary insult exposures failed to indicate any potentiating effect either in respect to the overall mortality or in the mortality-time experience.

Dr. Robert Frank, Harvard School of Public Health, Boston, Mass., reported on respiratory responses to sulfur dioxide in controlled human exposure. The effects of SO_2 alone and with an aerosol on the respiratory mechanics of healthy human subjects was measured by an esophageal catheter and a body plethysmograph. Thirteen subjects were exposed 26 times to concentrations of gas ranging from 1 to 20 ppm. During exposure to SO_2 alone, there was no change in pulmonary flow resistance at concentrations of 1 to 2 ppm, 19 percent increase (above control) from 4 to 5 ppm, while at 8 to 19 ppm it rose 49 percent. The average response to aerosol plus SO_2 in concentrations of 8 to 20 ppm was 72 percent.

The findings of Dr. Wright which follow are contrary to those of Dr. Frank. The discussion on the effect of SO_2 is given after Dr. Wright's paper.

Dr. George Wright, St. Luke's Hospital, Cleveland, Ohio, investigated the pulmonary reaction of normal and emphysematous persons to the irritations of SO_2, fly ash, and moisture. Eight normal men and four persons having diffuse obstructive emphysema were exposed for 20 to 25 minutes to SO_2 in concentrations ranging from 2.5 to 23 ppm, particulates less than 10 microns in size varying from 6 to 1.2 million particles per cubic foot, and water aerosol. Airway resistance, maximum and minimum midexpiratory flow rates, maximum breathing capacity, timed vital capacity, pulmonary volumina, and ventilation effectiveness were measured before and within 20 minutes after exposure. The normal subjects showed no trend as to resistance changes consequent to exposure. None of the variations following the exposure were greater than hour-to-hour or day-to-day variations of control, nonexposed persons. Four men having classic clinical and physiologic evidences of diffuse obstructive emphysema were exposed for 20 minutes to 5 ppm SO_2, 6.0 million particles per cubic foot,

and added water aerosol. Each individual demonstrated a decrease in the airway resistance, and no change in other measurements following the exposure. A vigorous discussion followed, as the results of Dr. Wright do not agree with those of Dr. Frank, who found an increase in airway resistance after exposure to SO_2. Dr. Patrick J. Lawther, St. Bartholomew's Hospital, London, stated that his findings indicated that, with the exception of the rare SO_2 sensitive individuals, the net effect of SO_2 exposure was a slightly beneficial loosening of mucus within the bronchial tree.

Dr. Frank stated that this was contrary to his findings; SO_2 above 5 ppm would produce a statistically significant change in airway resistance. Attempts by the group to explain this discrepancy brought out the fact that there was a slight lag time in Dr. Wright's measurement after exposure, while Dr. Frank's subjects were measured while breathing the gas. In addition, it was pointed out that Dr. Frank's subjects mouth-breathed, bypassing whatever protective action is supplied by the nasal passages, while Dr. Wright's subjects were free to nose-breathe, thereby possibly increasing the washout of SO_2.

Dr. Branscomb added to the discussion the fact that numerous intermittent exposures to 1 percent SO_2 from an aerosol bomb over a 40-minute period produced no change in respiratory loops on his testing equipment but caused cough and expectoration.

Dr. Roger Wilson, University of California Medical Center, San Francisco, reported the results of a 3-year study of the effects of weather and of air pollution in patients with chronic bronchitis and emphysema from a sporadically polluted area in San Francisco. Studies were limited to simple ventilatory tests and diaries kept by patients. An immediate irritant effect separate from the Los Angeles studies of Motly is implied from the demonstrated relationship between worsening ventilatory tests and an ambient pollution level higher than the average in the community. Double blind studies with bronchodilators and cough suppressors show a suggestive reversal of the adverse pattern.

Dr. Thomas Lloyd, Jr., St. Luke's Hospital, Cleveland, Ohio, discussed methods commonly used for recognizing acute changes in airway resistance. The body plethysmograph, Clements interrupter, Wright peak flow meter, maximum breathing capacity, and forced expiratory vital capacity were used for pulmonary function testing. Data indicated that the body plethysmograph was a highly sensitive indicator of an induced change in airway resistance and the Clements interrupter was a very insensitive method. The remaining methods varied to a minor degree, and choice between them would depend on other factors. These methods covered a middle ground of sensitivity, but all could be considered clinically useful.

Effects of Air Pollution

Dr. George H. Hepting, Forest Service, U.S. Department of Agriculture, Asheville, N.C., was concerned with the possibility of air pollution as the causative agent of a needle blight of white pine found in the southern Appalachian region. The browning or blighting of the needles of conifers is common with many diseases and upsets of the tree. Dr. Hepting described the various blights of known etiology of the region. There remains one blight in the area for which the etiology has not been established. Air pollution may be a factor in this blight. In the discussion, Dr. Katz of Canada queried the speaker in some detail on comparative symptomology with sulfur dioxide injury. Effects similar to those described by Dr. Hepting are noted in Canada and differentiated from other blights.

In reporting on the studies conducted at Texas Agricultural and Mechanical College, College Station, by Dr. Wayne C. Hall and Dr. Walter W. Heck on the effects of ethylene on plants, Dr. Heck presented in detail the symptoms developed by this toxicant, especially on cotton. In addition to the known effect of abscission of the developing flower bud (square), there appears to be an alteration in growth habit best described as a loss of apical dominance.

Marcella Juhren, working at Los Angeles State and County Arboretum, Arcadia, Calif., with W. S. Stewart and W. M. Noble, reported some possible effects of oxidant type smog on plant growth. Using tomato root cultures, they found that "smoggy" air promoted the development of tertiary rootlets. From other data on the effects of plant hormones in relation to

sensitivity the Los Angeles workers believe that smog may be altering the hormonal balance in the plant. These two possible effects on the growth control mechanisms of plants reported by Dr. Heck and Mrs. Juhren may open up entirely new areas of investigations in this field of air pollution effects on plants.

Dr. Leonard M. Schuman, School of Public Health, University of Minnesota, Minneapolis, presented a progress report on an epidemiological study of silo fillers' disease. He reviewed some of the acute exposures to gas in silos, presumed to be NO_2, and reviewed his epidemiological evidence of a 10 percent excess of chronic pulmonary disease in a random group in one county with a history of work in silos.

Dr. Richard A. Call, Provo, Utah, presented autopsy findings on residents of an area which had experienced elevated atmospheric fluoride levels. His findings do not indicate any appreciable bone accumulation of fluoride due to the atmospheric exposure. However, the study has shown a relation between renal disease and bone fluoride levels above normal for the age group. Dr. Call suggested that the elevated fluoride levels were probably the result of the renal disease and had no relation to the cause of the disease. He intends to follow this lead in further studies because of the need for a better understanding of fluoride metabolism under conditions of renal impairment.

Dr. Harold J. Paulus, School of Public Health, University of Minnesota, Minneapolis, is studying the possible relation of air pollution from the grain industry to outbreaks of allergic asthma in the student body and staff of the university. Review of medical records of 228 asthma patients of the past few years gave evidence linking grain pollutants to individual asthmatic attacks.

Dr. Charles E. Schoettlin, consultant to the Air Pollution Medical Branch, Public Health Service, used two groups of men from a Veterans Administration domiciliary home to study the possible effects of urban air pollution on chronic respiratory disease. One group which had a high prevalence of chronic respiratory disease was compared with a control group selected from the same restricted population. The basic problems of sample selection, controls, and handling of data were discussed. The problems of selection of response criteria and measures of air pollution used were outlined, and results of the study were reported. Smoking for 10 years or more was associated with an increased prevalence of chronic respiratory disease.

Dr. Herbert C. McKee, Southwest Research Institute, San Antonio, Tex., discussed the problems of corrosion in relation to atmospheric effects. Using examples from his work on corrosion of parts in ordnance material, Dr. McKee brought out the complexities of relating a specific corrosion problem back to the original pollutants and atmospheric conditions which were responsible for the corrosion. This requires detailed studies of atmospheric chemistry and of reactions at air-solid interfaces. It also often requires the persistence of a detective to determine all the possible substances available for reaction.

Engineering

Dr. Hikmet M. Binark, former professor, Pennsylvania State University, now at the Technical University of Istanbul, Turkey, reported the results of an experimental and theoretical study of inertial impaction in cyclone separators. Impaction efficiencies were determined by measuring mist concentrations before and after passage through the collector under test. An oil mist, used as the test material, was sampled by use of rectangular jet stages which divided the samples into six size fractions. Other investigators reported that dense oil fogs tended to agglomerate and deposit on surfaces. These interferences were at a minimum in this work because of the low concentrations used. Theoretical calculations were based on complete mixing of droplets. Cyclone velocities were measured with a hot wire anemometer, and by changing orientation of the anemometer, flow patterns could be detected. Impaction efficiency was found to vary with the number of turns the airstream made, and the number of turns was dependent on the air inlet velocity.

Dr. Seymour Calvert, professor of chemical engineering, Case Institute of Technology, Cleveland, Ohio, spoke on a number of studies related to the fundamental mechanisms of gas and particulate collection. Oscillating bodies of

liquid attached to solid supports were evaluated with respect to their scrubbing effects when a gas stream was blown past them. In order to determine collection efficiency, the oscillating drops were removed from the wire support and analyzed for dust retention by blood counting techniques. Other studies on gas cleaning dealt with use of frothing agents to extend the gas-liquid interface and the use of strong secondary flow patterns in conduits to increase gas-liquid contact and improve the scrubbing effect of the liquid.

The report of Prof. E. R. Kaiser, senior research scientist, College of Engineering, New York University, New York City, on a variety of incinerator problems was read by James Halitsky. Work previously reported by N.Y.U. has shown how air pollution from flue-fed incinerators can be reduced by use of hopper locks on the flue, overfire air jets in the furnace, auxiliary gas firing, and flue-gas scrubbers. The use of barometric and orifice dampers in the flue is being evaluated since entrainment of particulate matter in flue gases can be markedly reduced by control of upward gas velocities during burning.

Plans are underway for research on incinerators for burning junked automobiles prior to the salvage of steel and other metals. A prototype suitable for burning 30 car bodies a day is to be built and tested. Smokelessness is to be achieved by an oil-fired afterburner.

Walter J. Smith, Arthur D. Little, Inc., Cambridge, Mass., discussed the use of bag filters in gas cleaning. Successful operation of glass bag filters requires proper fabric design, adequate fiber lubrication, correct mounting, minimum mechanical working of bag, and adequate maintenance. A number of proprietary compounds have been used as lubricants for glass fiber filters. These are for the most part silicone compounds. Though they are inorganic in nature, they do have some organic constituents that might be oxidized and thus cause problems. Collodial graphite was one of the best lubricants tried by Arthur D. Little, Inc., provided it was worked well into the fibers of the filter material. Lubricated glass fiber bags have worked effectively at temperatures up to about 500° F. Bags used above this temperature have shown reduced service life.

Dr. Kenneth T. Whitby, University of Minnesota Institute of Technology, Minneapolis, described research being conducted on air cleaners for occupied spaces. Seventeen types of air cleaners have been evaluated with respect to stain efficiency, weight efficiency, loading characteristics, and efficiency of removal of natural airborne micro-organisms. Considerable work has been done with generation of aerosols for use in this evaluation. Homogenous aerosols of methylene blue have been created in ranges from 0.6 to 15 microns diameter. A generator for this purpose can be produced for less than $500. An impactor with a Collison atomizer is being built to produce aerosols in the 0.1 to 1.0 micron range. A method has been developed to reduce agglomeration tendency of aerosols due to electric charges on them. The charge on aerosols is balanced by mixing with a high concentration of gas ions generated by an electrical ionizer.

James Halitsky, College of Engineering, New York University, New York City, reported on studies of vented gases around buildings. Many industrial buildings discharge combustion, laboratory, and process gas through short stacks on flush openings in sidewalls and roofs. Gases are eventually borne away by the wind, but not until they have circulated about the building, polluting air in the neighborhood of ventilation ducts and open windows. Wind tunnel studies were made of simple geometrical building shapes. With no buoyancy in the exhaust, the most important factor affecting the general level of contamination at points on a building distant from the exhaust opening is the turbulent wake of a building. Gas will sometimes be found at upwind locations on a building even if the exhaust is on the lee side. Eddy effects evidently play a major role in establishing the local pollution pattern. An equation was proposed which would permit translation of wind tunnel results to full-scale buildings.

Environmental Levels of Pollutants

Randolph C. Specht, American Agricultural Chemical Co., Pierce, Fla., discussed the results of a study of the uptake of fluorides by grass grown on Florida soils which had been leached with water containing fluorides. It was demon-

strated that soils have the ability to fix fluoride ions from fluoric acids and calcium fluoride either directly or as components of superphosphates. Grass grown on soil previously leached with water containing fluorides showed approximately the same fluoride content as grass grown on soil leached with distilled water.

A new technique for the identification of malodorous kraft pulp mill effluents was described by Donald F. Adams, Division of Industrial Research, Washington State University, Pullman. The gaseous pollutants are first collected on activated silica gel, then transferred to a gas chromatograph for preliminary separation, after which the malodorous gases are trapped and identified by rechromatographing on a gas-liquid column. Retention of the different types of malodors is accomplished by adsorption and condensation at dry ice-acetone temperature. Desorption of the sample is brought about by sweeping the column with helium while increasing the temperature from −78.5° C. to 100° C. After allowing trapped CO_2 to escape, the eluted gases are collected in a liquid nitrogen trap. The condensed gases are analyzed in the conventional manner, using a gas-liquid column and the rising temperature technique. The study was sponsored by the National Council for Stream Improvement.

Humberto Bravo A., air pollution consultant, Instituto de Ciencia Aplicada, University City, Mexico, presented a report on pollutants found in the atmosphere of Mexico City in 1959. Monthly dustfall measurements, made in a residential area, ranged from 7 to 16 tons per square kilometer per month, with higher values during the rainy season (April–August), while those made in an industrial area ranged from 22 to 53 tons, with little seasonal variation demonstrated. Suspended particulate levels were lower during March through October, ranging from 40 to 130 $\mu g/m^3$, with values from 70 to 380 $\mu g/m^3$ being observed during the winter months. The benzene soluble organic matter obtained from particulate samples contained a relatively high proportion of aromatic hydrocarbons. Gaseous pollutants were measured over a 6-month period with the following average values found: oxidants, 0.01 ppm; SO_2, 0.161 ppm; NO_2, 0.09 ppm; aldehydes, 0.24 ppm; and ammonia, 0.02 ppm.

Concentrations of carbon monoxide and carbon dioxide in the atmosphere of Mexico City were reported by Dr. Armando P. Baez, University of Mexico. Carbon monoxide levels, measured at 3.5 meters above street level, show variations that can be related to traffic density and meteorological conditions. Average concentrations at nose level ranged from 15 to 40 ppm, with maximum values three times the average. Carbon dioxide concentrations measured at 3.5 meters above street level showed little correlation with carbon monoxide concentrations.

J. Cholak, University of Cincinnati, Cincinnati, Ohio, discussed the findings of a continuous monitoring program conducted in Cincinnati from January 1957 through December 1959. Automatic apparatus was used to record the instantaneous concentrations of oxidant and nitrogen dioxide. Sequence samplers were used to sample the air for its content of sulfur dioxide. High-volume samplers were used to collect 24-hour samples of particulate matter. AISI smoke samplers were also operated at the stations in order to determine the soiling property of the air and the diurnal fluctuations in the concentrations of particulate lead compounds present in the air. Average hourly concentrations of oxidant ranged from less than 1 part per hundred million to 8 pphm at the downtown station and from less than 1 pphm to 24 pphm at the Avondale station which was centrally located in respect to local population density and general activity. The concentrations of oxidant varied seasonally, the highest concentration generally occurring during the summer months. Average hourly concentrations of oxidant greater than 15 pphm were present for only 14 hours (most of them in August) out of the 5,774 hours of monitoring at the Avondale station.

The concentration of nitrogen dioxide was always higher in the downtown area than for Avondale. At the downtown station average hourly concentrations less than 1 pphm occurred for 161 hours out of a total of 6,873 hours of continuous monitoring. Average concentrations of nitrogen dioxide in excess of 15 pphm were present for a total of 43 hours. The maximum hourly concentration of nitrogen dioxide was 20 pphm. At the Avondale station

716 hours of a total of 4,621 hours of sampling yielded average concentrations below 1 pphm. No average hourly concentration in excess of 15 pphm was present in the air at the Avondale station during 1957.

George D. Clayton, of G. D. Clayton and Associates, Inc., Detroit, Mich., discussed the relationship of street level CO concentrations to traffic accidents. Three recording infrared CO analyzers were set up at various locations in Detroit. One recorder was located for 27 weeks on a depressed highway within the city and showed CO readings ranging from 0 to 100 ppm with a median of approximately 8 ppm. Another recorder, placed in a busy neighborhood shopping area for 58 weeks, showed CO levels ranging from 0 to 100 ppm, with a median of 10 ppm. For 21 weeks a third recorder was operated in downtown Detroit, with CO readings of from 0 to 100 ppm and a median of approximately 9 ppm. The CO in the atmosphere of a residential area was sampled during a period of 18 weeks. Concentrations of from 0 to 29 ppm were recorded, with a median of only 2 ppm. Data were correlated with such factors as traffic count and meteorological conditions. From these data attempts were made to predict under what conditions dangerous concentrations of carbon monoxide can be created in the atmosphere.

Dr. Philip W. West, Louisiana State University, Baton Rouge, reviewed the use of aerial observations in the study of air pollution. Four years of experience have provided convincing evidence of the value in the use of aerial observations and aerial photography combined with chemical and physical studies of air pollution. Aerial photographs are particularly useful in correlating what can be seen with what is found by means of physical and chemical studies. Furthermore, aerial perspectives often prove convincing to plant personnel when analytical data fail to make a significant impression. Ground-to-air communications make it possible to effectively direct the sampling schedule so that the optimum sample points are selected. In addition, valuable information on temperature lapse rates can be obtained by following temperature gradients during takeoffs and landings.

Toxicology

Three reports dealing with effects of gaseous air pollutants at cellular or subcellular levels indicate the concern of a number of investigators with the pathways by which these substances exert injurious effects in animals. Aliphatic nitro compounds, including unsaturated forms, have been implicated as components of gaseous air pollutants and studied as representative of eye and respiratory tract irritants (unsaturated forms).

Test concentrations, 4–6 ppm oxidant, as far as can be judged in tissue culture, are still far above realistic air pollution levels as were levels in subacute studies of animals exposed to nitro-olefins in research conducted by William B. Deichmann and William E. MacDonald, department of pharmacology, University of Miami School of Medicine, Coral Gables, Fla. Exposures to 20 ppm were carried out for 6 hours per day 5 days a week for a total of 4 to 35 exposures. Conjugated nitro-olefins, particularly 2-nitro-2-butene and 4-nitro-4-nonene, were highly injurious and potent irritants to all rabbits, guinea pigs, rats, and mice exposed, although wide variations were noted. The rats were particularly susceptible; guinea pigs were most resistant.

Similarly, aliphatic nitro compounds (nitroethane 2-nitropropane) inhibit O_2 consumption of isolated leucocytes, alter succinoxidase, cytochrome oxidase, and phosphate metabolism of tissue homogenates, in so intricate a manner that one must, for the present, conclude that a beginning is just being made in unraveling the mechanism of these highly complex toxic responses at the cellular level. These were the findings of Dr. Frances L. Estes, Baylor University College of Medicine, Houston, Tex., and Dr. Joseph L. Gast, Resources Research, Inc., San Mateo, Calif. To such ends it is hoped that useful guides for studies of the systems affected in the intact animal exposed to these pollutants will first be determined by further enzyme studies.

Dr. Donald M. Pace and Dr. James R. Thompson, University of Nebraska, Lincoln, found that HeLa cell growth was significantly modified in tissue culture by levels of 10 ppm ozone for 4 hours, or NO_2 at 5 ppm for 5 days.

No indication of tolerance to these pollutants was noted.

Experimentalists in air pollution research are continually searching for evermore sensitive means of detecting subtle and borderline responses in their experimental hosts. Dr. Robert D. Boche, College of Medical Evangelists, Los Angeles, Calif., reported such a test. Mice exposed to synthetic smog containing an average ozone concentration of 0.51 ppm showed 64 percent reduction in spontaneous wheel-turning activity, but were relatively less affected by the gasoline component which had a threshold of 22 ppm. Although it is realized many factors influence this activity, the method was felt to be a highly sensitive indicator of air pollutant effects. Further work is indicated to relate activity decrease to toxicity.

Another basic question amenable to animal experiment is the relation of continuous to intermittent exposure to air pollutants. Dr. Robert M. Heyssel, Vanderbilt University, Nashville, Tenn., reported that groups of rats subjected to round-the-clock exposures of SO_2 gas at a series of levels from 1 to 32 ppm showed responses that increased with increasing concentrations. Although the study is not yet finished, it would appear from results thus far that continuous exposure to the respiratory irritant SO_2 provokes more severe reaction in rats than an equivalent level intermittently. Whether the same exposure duration (concentration time value) intermittently will result in the same response as that from a continuous exposure of equal duration remains to be determined. The possibility of nutritional alteration of the rat diet from continuous SO_2 exposure should be considered in final appraisal of the results, a variable not as yet eliminated.

Dr. Ralph G. Smith, Wayne State University, Detroit, Mich., reported that exposing laboratory rats and guinea pigs to concentrations of pure phenol vapors as high as 100 ppm produced no unexpected findings. Rats which received intratracheal injections of enriched phenolic complex from the air displayed increased phagocytic activity in the lung, associated with minute pigmented areas and focal granulomata. Similar findings were observed in rats receiving unchanged particulate matter and the total organic complex from airborne particulate matter. The study is still in progress.

A mechanism involving molecular physics designed to form the base of an understanding of the repeatedly reported synergistic properties of aerosols to intensify or attenuate the toxic or irritant effects of gases and vapors was proposed by Dr. Alexander Goetz, California Institute of Technology, Pasadena. The basic assumption of his theory of synergism is that an accumulation of the toxic gas molecules results from their partial or total adsorption on the surface of the particulates which in turn carry the gas in more concentrated form to the susceptible lung tissue. Whether this synergism acts in the intensifying or attenuating sense depends on whether this type of reaction between gas and particulate is such as to promote or prevent the transfer of the adsorbed gas molecules onto the tissue surface, subsequent to its contact with the particle. The theory is in good agreement with experimental results already obtained in animals. Moreover as predicted from theory (finite number of gaseous adsorption layers) the synergistic effect vanishes for high relative irritant concentrations and increases with increasing aerosol concentrations for low irritant levels.

Automotive Exhaust Research

Dr. W. L. Faith, Air Pollution Foundation, San Marino, Calif., reported on proposed methods for the control of automotive exhaust emissions. Olefinic hydrocarbons, carbon monoxide, and polynuclear hydrocarbons have been indicated as pollutants requiring effective control. Due to the variability of the energy level (combustible concentrations) and oxygen level in the automotive exhaust gases, the most promising method of alleviation is afterburning of the contaminants. Three such systems are under development: direct flame afterburners with heat exchangers, direct flame afterburners with auxiliary fuel, and oxidation catalyst converters. The chief problems facing the developers at present are related to the equipment size, materials of construction, methods for combustion, air addition, maintenance, and replacement requirements and costs.

James M. Chandler, chairman, vehicle combustion products committee, Automobile Manufacturers Association, Detroit, Mich., discussed the automobile industry's recent developments in the control of automotive emissions. Current research on control actively centers on three contaminant sources: the exhaust, the crankcase ventilation, and the fuel systems. Limited success in the reduction of the hydrocarbon and carbon monoxide from the exhaust system has been achieved with oxidation catalytic converters and direct flame afterburners. The problems of warmup time, equipment size and life, and operating dependability and cost are unresolved. Techniques for the reduction of oxides of nitrogen exhaust emissions have not given encouraging results to date.

An inexpensive control device for the elimination of crankcase vent fumes has been developed and will be available on all 1961 American cars on sale in California. Control of hydrocarbon losses from the fuel system is under industry study. Two proposed solutions being investigated are the use of less volatile fuels and the use of mechanically sealed fuel systems.

William E. Scott, Scott Research Laboratories, Inc., Perkasie, Pa., reported on the progress in the development of catalysts for the reduction of nitric oxides in the exhaust by the carbon monoxide or hydrogen components in the exhaust or both. Zinc-copper chromite, iron chromite, barium-promoted copper chromite, and chromium-promoted iron oxides were indicated as efficient catalysts for removing nitric oxide from synthetic mixtures by reaction with carbon monoxide at temperatures of 220° to 320° C. Chromites possibly would also induce oxidation of hydrocarbons and carbon monoxide in the presence of excess oxygen. Experiments using actual exhausts are continuing in order to establish the effectiveness of the catalysts in both leaded and unleaded fuels.

Joseph Grumer, Explosive Research Laboratory, U.S. Bureau of Mines, Pittsburgh, Pa., reported on the feasibility of using ducted diffusion flames in automotive exhaust afterburners. Exploratory experiments using simulated idle exhaust gases indicate that diffusion flames have wider flame stability limits than rich semidiffusion and slightly lean premixed flames. If, therefore, the high temperature of the exhaust gases as they are discharged from the engine is employed, complete premixing of the exhaust gases and combustion air prior to burning is undesirable. Tests indicate that under the conditions of the experiment, carbon monoxide and saturated hydrocarbon (butane) were completely burned, a small percentage of the hydrogen remained, and the unsaturated hydrocarbon (isobutylene) was reduced by about 80 percent.

Dr. Robert B. Anderson, Central Experiment Station, U.S. Bureau of Mines, Pittsburgh, Pa., described studies using metal oxide catalysts for the oxidation of automotive exhaust hydrocarbons. A variety of pure metal oxides and supported catalysts are being evaluated. Oxides impregnated on robust alumina indicate, in order of decreasing activity, that chromium, manganese, vanadium, iron, uranium, copper, and cobalt are effective in hydrocarbon removal.

Tests employing automotive engine exhaust have been used in the evaluation of the robust catalyst supports and to examine surface deposits from leaded gasolines. Spherical pellets of γ-alumina meet most of the requirements for a catalyst support.

Dr. Patrick J. Lawther, Medical Research Council, Dunn Laboratories, St. Bartholomew's Hospital, London, discussed pollution of the atmosphere by carbon monoxide, oxides of nitrogen, smoke, and polycyclic hydrocarbons from automotive exhaust. This study emphasized the effect on the ambient air as measured in garage areas, low-level street areas, and vehicular tunnels. The garage area studies indicated that diesel buses contributed insignificant amounts of polycyclic hydrocarbons and the levels of carbon monoxide and oxides of nitrogen were well below maximum allowable concentrations. The tunnel studies, designed to evaluate the effect on the atmosphere of all types of vehicles under varying conditions of load and maintenance, indicated concentrations of polycyclic hydrocarbons equivalent to those found in the urban air in the winter months. Carbon monoxide concentrations measured at street level reached values as high as 350 ppm. Work with this latter contaminant will be continued.

Pathology

Dr. Seymour Farber, University of California Medical Center, San Francisco, described a technique which has great potential as a method for early detection of lung cancer. The technique is dependent on observation of metaplastic cell types in the sputum. These changes have been observed in the sputum of patients both during and following the administration of desoxyribonucleic acid. This technique resembles the Papanicolaou smear technique for cervical carcinoma and its accuracy compares favorably with that of the latter technique. A comparison between percentage of positive cytologic results and percentage of nonpositive cases is being conducted on a series of 300 patients with trysin used as a digestive agent and may be even more productive in positive findings.

Dr. Kenneth P. Knudtson, University of Washington Medical School, Seattle, discussed the relation of environmental factors to pathologic changes in the human trachea and bronchi. Dr. Knudtson's study dealt primarily with epithelial changes in the lung. He has observed alterations of the epithelium manifested as decreased numbers of goblet cells, loss of cilia, and metaplasia of the epithelium, and, particularly in heavy smokers, a secondary stimulation of submucosal glands probably related to metaplasia extending downward from the mucosa, blocking these glands and causing accumulation of secretions. This cellular metaplasia is most severe at the bifurcation of the bronchi and to a lesser degree at lower bifurcations. The location of these changes is explained by ciliary motion concentrating irritants at these particular points. No difference between cases grouped according to residence in urban or rural areas has been observed.

Lung carcinogenicity induced by intratracheally injected radioactive $BaS^{35}O_4$ and $Ce^{144}F_3$ was discussed by Dr. Herman Cember, University of Pittsburgh Graduate School of Public Health, Pittsburgh, Pa. Dr. Cember's studies indicate that the time factor during which the radiological insult is administered is an important consideration in determining the carcinogenicity of inhaled radioactive dusts. Barium sulfate, which was cleared out of the rats' lungs in a matter of days, did not produce lung cancer when given as a single dose of 4,500 μc. Ten small doses of 375 μc each over a 20-week period, however, resulted in bronchogenic carcinoma. Cerium fluoride, on the other hand, which was found to be tenaciously retained in the lungs, produced bronchogenic carcinoma after a single exposure of 4 μc.

A higher incidence of respiratory infection was observed in animals exposed to both radioactive materials than those not exposed. Most of the deaths in these exposed animals occurred within several months following exposure.

Dr. Jerome Kleinerman, St. Luke's Hospital, Cleveland, Ohio, and Saranac Laboratory, Saranac Lake, N.Y., reported on pathological changes in the lung induced by inhalation of nitrogen dioxide gas. Preliminary study indicates that the respiratory epithelium reacts similarly to repetitive gaseous exposure as it does to acute exposures, provided the tissues are allowed to recover between exposures.

Clinical observations have shown that animals that recover from acute gassing with high concentrations of nitrogen dioxide suffer from either moderate dyspnea or faint cyanosis immediately after exposure or within 48 hours. However, clinical recovery seems to be complete.

Histologically, accumulation of inflammatory exudate and epithelial proliferation were prominent changes observed in the walls of the respiratory bronchioles and proximal alveolar ducts. The changes appeared to be reversible, with no indication of permanent tissue damage or bronchiolitis obliterans.

Chemistry

Dr. Amos Turk, department of chemistry, City College, New York City, reported on studies of both fundamental and practical importance concerning sampling of vapors on activated carbon and on the recovery of materials so adsorbed. Of particular interest is his work on the impregnation of carbon with more or less specific reagents to remove certain chemicals which would not otherwise be collected as completely by the carbon. For example, he showed brominated charcoal to have a very high affinity for olefins, including ethylene; charcoal impregnated with sodium silicate will remove hydrogen fluoride with extremely

high efficiency. Other factors mentioned were techniques for recovery of sorbed material, the removal of water from collected materials, and the nature of the so-called "carbon odor."

The results of sampling with another technique, this time for particulate matter, were presented by Dr. Alexander Goetz, professor of physics, California Institute of Technology, Pasadena. Dr. Goetz has been sampling natural aerosols at sea, in the mountains, on the deserts, and in forests. Under appropriate conditions, he found all of these aerosols, as collected with the "aerosol spectrometer," to contain a large fraction of material which is volatile on standing. Humidity conditions seem to have little effect on this volatility. The results probably indicate that nature is fully capable of producing substantial concentrations of organic particulate matter without human assistance and that these particles are not in a stable equilibrium with the air in which they are suspended.

One of the problems facing the chemist who seeks to identify organic air pollutants is the fact that the atmosphere seems able to synthesize compounds which the organic chemist has not yet made and characterized. Dr. Frank A. Vingiello, Virginia Polytechnic Institute, Blacksburg, is engaged in filling the gaps in one particular class of compounds, the substituted dibenzopyrenes. He has successfully synthesized a number of methylated dibenzopyrenes by an unequivocal route. These have been characterized by melting point, spectral behavior, and related physical means.

Two papers were concerned with various aspects of the chemistry of oxidizing atmospheres of the type characteristic of Los Angeles. Dr. Jack G. Calvert, professor of chemistry, Ohio State University, Columbus, discussed the reaction of methyl radicals with oxygen. His work shows that this system is capable of generating ozone without the presence of nitrogen oxides. Since methyl radicals can be generated by the photolysis of a number of types of organic substances, this offers an alternate route to smog formation which does not involve the original mechanism postulated by Haagen-Smit. The end products of this particular reaction chain were methyl alcohol and formaldehyde. This is of further interest because of the present opinion that formaldehyde may be at least one of the substances responsible for eye irritation in the Los Angeles atmosphere.

Photochemical research of still more direct application for the air chemist was presented by Dr. Robert R. Austin, Robert R. Austin Laboratories, San Gabriel, Calif. The apparatus which has been used up to this time for the determination of the so-called "oxidant precursor" has been extremely bulky, and has posed serious problems of power consumption, heat dissipation, and time delay in recording changes in this parameter. Dr. Austin has designed a much smaller chamber giving similar results with one-tenth the power output and approximately one-fifth the residence time. The two types of chamber do have differences in their behavior toward individual hydrocarbons.

Initial results with an apparatus which simulates more closely the actual conditions of the atmosphere were reported by Dr. Lyman A. Ripperton, department of sanitary engineering, University of North Carolina, Chapel Hill. While his results shed little light on the intimate details of atmospheric reaction mechanisms, they showed that at least some of the oxidative processes of the atmosphere can lead to the formation of compounds of much higher unsaturation than those initially present. Largely using visible light, he irradiated mixtures of nitrogen dioxide and 1-hexene. The products appeared to include acetylenic compounds. Even more surprising, there was some evidence that aromatization had occurred; the products gave positive tests which indicated the presence of phenols. Possible physiological action of the products was studied by the use of the micro-organism *Serratia marcescens*. However, consistent results have not yet been obtained.

Dr. R. J. Cvetanović, National Research Council of Canada, Ottawa, reported on the reactions of oxygen atoms, which are known to be formed in the atmosphere by the photolysis of nitrogen dioxide with butadiene as well as with a number of other olefinic materials. His results suggested that under normal atmospheric conditions, the products of this atomic oxygen attack could well be indistinguishable from those of reaction with ozone. In the ab-

sence of molecular oxygen but at a pressure of 1 atmosphere, however, the reaction products from butadiene were almost entirely butadiene monoxide and 3-butenal.

Community Studies

Dr. John J. Phair, University of Cincinnati, Cincinnati, Ohio, reported on the design of epidemiological investigations of community air pollution. Dose, resistance, and response must be defined in reasonably exact terms in any epidemiological investigation of the health effects of air pollution. Data analysis must also make provision for adjustment of variation in degree and time in pollutant concentration. Epidemiological investigations do not replace but supplement the work being done in industrial plants, experimental laboratories, and community surveys.

Dr. Robert Lewis, Tulane University, New Orleans, La., discussed the methods and results of the New Orleans asthma study. Admissions for emergency asthma treatment were correlated with local meteorological data. Results to date suggest there might be more than one cause and more than one potential point source, as indicated by differences in outbreak episodes as related to atmospheric conditions, age groups affected, and the geographic distribution of cases.

Victor Sussman, Pennsylvania Department of Health, Harrisburg, discussed methods of establishing a statewide air sampling system. Three approaches were considered: a random sampling method with some bias toward problem areas, maintenance of sampling equipment for emergency use or specific studies, and area and community studies involving sampling, source inventories, and calculations of area pollution levels. Two years of evaluation of the three surveillance methods has demonstrated the advantages of surveys in which most of the data come from source inventories. Sampling equipment maintained in seven State regional offices was used successfully for specific studies or in emergencies. Random sampling was found not to be practical.

Dr. Louis Zeidberg, Vanderbilt University, Nashville, Tenn., discussed the general aspects and medical phase of the Nashville air pollution study. The Nashville project, a joint engineering and medical investigation, was set up to gain knowledge on the methodology of measuring air pollutants in an urban community and to assess health effects of the various measured pollutants on the people of the community. The objectives, plan of study, and methods of data analysis of the morbidity, mortality, cardio-respiratory disease, and anthracosis studies were described.

Jean Schueneman, Public Health Service, Cincinnati, Ohio, described the engineering aspects of the Nashville study. Aerometric studies were discussed in terms of objective, equipment used, and analytical methods employed. Other activities were outlined, including preparation of a sulfur dioxide emission inventory, sampling of public opinion on air pollution, and forecasting of pollution levels.

Dr. Jan Lieben, Pennsylvania Department of Health, Harrisburg, discussed cases of beryllium disease which have been reported in areas adjacent to beryllium refineries and fluorescent light bulb plants. These cases were in persons living in the neighborhood of the plant without exposure either occupationally or through contact with contaminated clothing brought home for washing. The author accepts the level of 0.01 microgram of beryllium per cubic meter as the safe limit for outdoor concentrations.

Dr. John R. Goldsmith of the California State Department of Public Health, Berkeley, discussed the development of California's air pollution standards. In preparing the 1959 standards for ambient air quality, the department of public health set up three levels based on qualitatively different effects. The levels were designated "adverse," "serious," and "emergency." The procedure for setting up a standard was dissimilar from standard-setting for industrial exposure in a number of other ways. For example, the aim was to protect the most sensitive group of persons in the community, provided the group was definable in terms of age or medical status.

Radioactive Material in Bank Vaults

In March 1959, a representative of banking interests in the city of Seattle came to the Seattle-King County Department of Public Health with a letter from a prominent radiologist. The letter, dated February 18, 1959, ran as follows:

Dear ———:

Something has again come to our attention which I think might be of interest to the banking community. Twice, within approximately a year's period, we have had calls for information regarding radium which has been stored by private persons in a safety deposit box in the local bank. These have been people who have obtained radium in an estate, and knowing nothing better to do with it, have put it in the vault together with other valuables. This week, a very significant quantity of radium was removed from a safety deposit box in a Seattle bank where it had been since approximately 1945. Just as a community service for safety, we volunteered that we would store the radium in our radium safe here at the hospital until the person learned what she should do with it. At least it got it out of the bank vault where there is a general hazard to those who are around the bank vault continuously, and takes the radium out of her hands and any handling of it further.

I call this to your attention. I thought perhaps you would like to call it to the attention of the banking association locally. I would suppose that there are certain items that are prohibited in safety deposit boxes, but perhaps radium is not an item which had been thought of. Maybe there is more than one would think. On the other hand, there may be no more stored in Seattle banks, but it would be my guess that there is. In both instances, these quantities of radium were part of the estate of a physician who had died, and there was no sale for it at the time. Hence, as a valuable, it was stored.

Let me say that there is no acute emergency about this problem, but if the banks so desired, a Geiger counter survey of bank vaults could well find any radium which was stored there.

About 6 months before this letter was written, the health department had recruited a Radiological Health Technical Advisory Committee, with the mission of assisting the department in technical matters relating to local surveillance of radiation hazards. The committee includes a radiological physicist from a local hospital, radiological safety officers from a large industrial organization and the University of Washington, and an engineer engaged in radiation control work with the State department of health. This group concurred in the radiologist's recommendation for a survey.

A bank equipment sales and service company volunteered to perform the survey during the course of its routine service visits to the vaults. With the help of the technical advisory committee, a suitable device was procured for field testing, and personnel were instructed in its use. The survey began in May 1959 and continued through January 1960. For a nominal fee, each institution with a vault was offered the Geiger counter inspection service. Only 3 out of a total of 71 vaults refused this offer (4.2 percent).

A standard procedure for vault inspection was developed. The average background radiation in the surveyed vaults ranged between 0.005 and 0.01 milliroentgens per hour. These results are considered within normal limits; no additional radium or other radioactive material was found.

Radium, as used by physicians of an earlier era and the type likely to be uncovered, was packaged in such a way that the passing of time could permit escape of highly toxic radon gas generated by the decay of radium. Persons exposed to this radiological health hazard are probably few in number. Individuals who are now being exposed, albeit inadvertently, would find small consolation in the fact that their jeopardy is shared by only a few. However, so far as the health department has been able to determine, this is the first such survey made. There is comfort in the assurance that in this relatively young community of more than 800,000 persons, no additional radium was found. The probability of finding radium in bank vaults is unquestionably higher in some of the older and larger metropolitan communities.—D. R. PETERSON, M.D., *director of adult health division, Seattle-King County Department of Public Health.*

Federal Publications

Research Highlights in Aging. *PHS Publication No. 779; 1960; 52 pages; 25 cents.*

Approximately 50 selected papers on research in aging carried out or supported by the National Institutes of Health, Public Health Service, during 1959 are reviewed.

This booklet should appeal especially to those interested in details of aging changes in organic structure and function and their implications for research. The study subjects range from individuals and populations, organs and organ systems, tissues, and cells to subcellular structures and activities.

A reference list alphabetized according to principal investigator is included.

Nutrition and Food Service in Nursing Homes and Homes for the Aged. Selected references. *PHS Publication No. 786 (Public Health Bibliography Series No. 31); 1960; 11 pages; 15 cents.*

Directed to nutritionists, dietitians, nurses, and health department personnel, this annotated bibliography presents information on nursing homes, food habits and nutrition for older people, and provision of dietary consultation and nutrition services to institutions.

Pertinent food service and diet manuals developed by State health departments and dietetic associations, as well as other publications, are described.

Activities of the National Institutes of Health in the Field of Gerontology. *PHS Publication No. 761; 41 pages; 30 cents.*

Research grant and training projects active on January 31, 1960, and intramural research projects conducted during calendar year 1959 are divided into two groups according to whether they are related primarily or secondarily to aging.

A total of 580-odd projects are listed. They deal with general gerontology, major multidisciplinary research projects, identifiable disease processes, training, and structural, physiological, biological, psychological, and social aspects of aging.

The institute or division responsible for each grant is designated and principal investigators are indexed.

Digest of Prepaid Dental Care Plans, 1960. *PHS Publication No. 585; revised 1960; by W. J. Pelton and J. C. Rowan; 103 pages.*

All prepaid dental care plans known to be operating in the spring of 1960 are described briefly. Data are included on areas served, year established, number of enrollees, whether service or indemnity benefits, methods of operation, eligibility requirements, benefits offered and excluded, and method of financing.

Separate sections summarize information on benefits under Blue Cross and Blue Shield and list existing statewide dental service corporations.

The Mongoloid Baby. *Children's Bureau Folder No. 50—1960; 26 pages; 10 cents.*

One of a series for parents who have children with handicapping conditions, this booklet tells what is known about mongolism and advises parents of a mongoloid baby on the kinds of adjustments they may need to make. It points out some of the decisions parents must make, warning against hasty actions which might ignore the needs of the baby or his effect on his parents or other children in the family.

Some of the sources of help provided by the community and the State are given.

School Health. Selected references. *PHS Publication No. 799 (Public Health Bibliography Series No. 32); 1960; 10 pages.*

Selected texts and brochures, including publications of governmental and voluntary agencies and commercially printed material, on school-community health programs and administration are listed.

Phases covered include dental and mental health in schools, college health education, physical education and fitness, administration and policy, roles of the school nurse and the teacher, and reports of interagency conferences.

The Impact of Asian Influenza on Community Life. A study in five cities. *PHS Publication No. 766; 1960; by Irwin M. Rosenstock, Godfrey M. Hochbaum, Howard Leventhal, and others; 98 pages.*

Five research papers report effects of the Asian influenza epidemic on community agencies, selected industries, general population, physicians, nurses, pharmacists, and hospitals. Findings of a sero-epidemiological study are also given.

Study conclusions have implications for planning National, State, and local public health programs.

Control of Domestic Rats and Mice. *PHS Publication No. 563; revised 1960; 26 pages; 25 cents.*

Rodent-borne diseases, identification of domestic rats and mice, habits of these rodents and signs of their presence, and control methods are reviewed.

Detailed instructions for using poisons describe the characteristics of rodenticides and discuss bait formulas, bait placement, and prebaiting. Techniques for trapping rodents and gassing burrows and methods of ratproofing and ectoparasite control are outlined.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

The Public Health Service does not supply publications other than its own.

1960 INDEX

Public Health Reports

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and

Public Health Monographs

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THIS INDEX to *Public Health Reports* and Public Health Monographs is divided into a subject index and an author index.

The subject index carries one or more entries for each item published. In addition to the subject headings, categorical headings include ANNOUNCEMENTS (ORGANIZATIONS, PERSONNEL, SCHOOLS), CONFERENCE REPORTS, EPIDEMIOLOGICAL NOTES, EXHIBITS, LEGAL NOTES, and MONOGRAPHS.

Public Health Monographs published concurrently with *Public Health Reports* in 1960 are listed in numerical order under the category heading MONOGRAPHS. The monograph summaries appearing in the journal are indexed under appropriate subject headings.

One asterisk before the page number indicates an original, signed article. Two asterisks, used only in the author index, indicate a monograph. Entries without any symbol may refer to summaries or briefs of papers presented at conferences, narrative conference reports, statements or reports of committees, short reports without authors, or similar items.

Illustrative material on the inside of the front cover of each issue is indexed by month under the heading FRONTISPIECES. It is recommended that the covers be included in a bound volume.

An annual list of Public Health Service publications may be obtained from the Public Inquiries Branch, Office of Information.

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